



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

**STANDARD LOW BID PROJECT
Project Budgets Over \$100,000**

July 23, 2008

**Yuba State Park Restroom
Division of Parks and Recreation
Juab County, Utah**

DFCM Project Number 07347510

**L.K. Sorensen Associates, Inc.
1332 Duehl Circle,
SLC UT. 84123**

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Current copies of the following documents are hereby made part of these contract documents by reference. These documents are available on the DFCM web site at <http://dfcm.utah.gov> or are available upon request from DFCM.

DFCM Supplemental General Conditions dated July 15, 2008
DFCM General Conditions dated May 25, 2005.
DFCM Application and Certification for Payment dated May 25, 2005.

Technical Specifications : Attached and dated 7-7-08
Drawings: Attached and dated 7-7-08

The Agreement and General Conditions dated May 25, 2005 have been updated from versions that were formally adopted and in use prior to this date. The changes made to the General Conditions are identified in a document entitled Revisions to General Conditions that is available on DFCM's web site at <http://dfcm.utah.gov>

NOTICE TO CONTRACTORS

Sealed bids will be received by the Division of Facilities Construction and Management (DFCM) for:

DNR – PARKS AND RECREATION
YUBA STATE PARK RESTROOM
DFCM PROJECT NO:07347510

Bids will be in accordance with the Contract Documents that will be available on **Wednesday, July 23, 2008**, and distributed in electronic format only on CDs from DFCM, 4110 State Office Building, Salt Lake City, Utah and on the DFCM web page at <http://dfcm.utah.gov>. For questions regarding this project, please contact Jeff Reddoor, DFCM, at 801-971-9830. No others are to be contacted regarding this bidding process. The construction estimate for this project is \$360,000.00

A **mandatory** pre-bid meeting will be held at **1:00 PM on Friday, August 1, 2008** at Yuba Lake State Park, Entrance Station, Juab County, Utah. All bidders wishing to bid on this project are required to attend this meeting.

Bids will be received until the hour of **2:00 PM on Wednesday, August 13, 2008** at DFCM, 4110 State Office Building, Salt Lake City, Utah 84114. Bids will be opened and read aloud in the DFCM Conference Room, 4110 State Office Building, Salt Lake City, Utah. NOTE: Bids must be received at 4110 State Office Building by the specified time.

A bid bond in the amount of five percent (5%) of the bid amount, made payable to the Division of Facilities Construction and Management on DFCM's bid bond form, shall accompany the bid.

The Division of Facilities Construction and Management reserves the right to reject any or all bids or to waive any formality or technicality in any bid in the interest of DFCM.

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT
Joanna Reese, Contract Coordinator
4110 State Office Building, Salt Lake City, Utah 84114

PROJECT DESCRIPTION

Demolish and remove existing toilet and shower building.
New septic tank and drain field, concrete walk and gutter and pavement repairs.
Construct new 896 SF toilet and shower room building.
Concrete footings, foundation, and floor slabs.
Masonry wall construction with pre fabricated truss and roof framing system.
Factory finished metal fascia, soffit and roofing.
Culture stone and decorative stone exterior finish.
Metal doors frames and aluminum windows.
Ceramic tile and FRP finishes.
Plumbing, electrical power and lighting systems

**PROJECT SCHEDULE**

PROJECT NAME: YUBA STATE PARK RESTROOM				
DIVISION OF PARKS & RECREATION – JUAB COUNTY, UTAH				
DFCM PROJECT NO. 07347510				
Event	Day	Date	Time	Place
Bidding Documents Available	Wednesday	July 23, 2008	2:00 PM	DFCM 4110 State Office Bldg SLC, UT and the DFCM web site *
Mandatory Pre-bid Site Meeting	Friday	August 1, 2008	1:00 PM	Yuba Lake State Park, Entrance station, Juab County, UT
Last Day to Submit Questions	Thursday	August 7, 2008	3:00 PM	Jeff Reddoor – DFCM E-mail jreddoor@utah.gov Fax 801-538-3267
Addendum Deadline (exception for bid delays)	Monday	August 11, 2008	4:00 PM	DFCM web site *
Prime Contractors Turn In Bid and Bid Bond	Wednesday	August 13, 2008	2:00 PM	DFCM 4110 State Office Bldg SLC, UT
Sub-contractor List Due	Thursday	August 14, 2008	2:00 PM	DFCM 4110 State Office Bldg SLC, UT Fax 801-538-3677
Substantial Completion Date	Friday	January 30, 2009	5:00 PM	

* NOTE: DFCM's web site address is <http://dfcm.utah.gov>



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

BID FORM

NAME OF BIDDER _____ DATE _____

To the Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the "Instructions to Bidders", in compliance with your invitation for bids for the **Yuba State Park Restroom – Division of Parks & Recreation – Juab County, Utah – DFCM Project No. 07347510** and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: _____

For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

_____ DOLLARS (\$_____)
(In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete by January 30, 2009, should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **\$500.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of _____

The undersigned Contractor's License Number for Utah is _____.

Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in the Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract.

The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable 100% Performance and Payment bonds are not delivered within the time set forth.

Type of Organization:

(Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws:

Respectfully submitted,

Name of Bidder

ADDRESS:

Authorized Signature

INSTRUCTIONS TO BIDDERS

1. Drawings and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained as stated in the Invitation to Bid.

2. Bids

Before submitting a bid, each contractor shall carefully examine the Contract Documents, shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Representative and the necessary changes shall be accomplished by Addendum.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Invitation to Bid prior to the deadline for submission of bids.

Bid bond security, in the amount of five percent (5%) of the bid, made payable to the Division of Facilities Construction and Management, shall accompany bid. **THE BID BOND MUST BE ON THE BID BOND FORM PROVIDED IN THE PROCUREMENT DOCUMENTS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID.**

If the bid bond security is submitted on a bid bond form other than DFCM's required bid bond form, and the bid security meets all other legal requirements, the bidder will be allowed to provide an acceptable bid bond by the close of business on the next business day following notification by DFCM of submission of a defective bid bond security. **NOTE: A cashier's check cannot be used as a substitute for a bid bond.**

3. Contract and Bond

The Contractor's Agreement will be in the form found in the specifications. The Contract Time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the contract sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for subcontractors will be specified in the Supplementary General Conditions.

4. Listing of Subcontractors

Listing of Subcontractors shall be as summarized in the “Instructions and Subcontractor’s List Form”, which are included as part of these Contract Documents. The Subcontractors List shall be delivered to DFCM or faxed to DFCM at (801)538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the Contract Documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements is subject to a debarment hearing and may be debarred from consideration for award of contracts for a period of up to three years.

5. Interpretation of Drawings and Specifications

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the DFCM Project Manager a request for an interpretation thereof. The person or entity submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addenda posted on DFCM’s web site at <http://dfcm.utah.gov>. Neither the DFCM nor A/E will be responsible for any other explanations or interpretations of the proposed documents. A/E shall be deemed to refer to the architect or engineer hired by DFCM as the A/E or Consultant for the Project.

6. Addenda

Addenda will be posted on DFCM’s web site at <http://dfcm.utah.gov>. Contractors are responsible for obtaining information contained in each addendum from the web site. Addenda issued prior to the submittal deadline shall become part of the bidding process and must be acknowledged on the bid form. Failure to acknowledge addenda may result in disqualification from bidding.

7. Award of Contract

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of the State of Utah to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

8. DFCM Contractor Performance Rating

As a contractor completes each DFCM project, DFCM, the architect/engineer and the using agency will evaluate project performance based on the enclosed “DFCM Contractor Performance Rating” form. The ratings issued on this project will not affect this project but may affect the award on future projects.

9. Licensure

The Contractor shall comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah.

10. Permits

In concurrence with the requirements for permitting in the General Conditions, it is the responsibility of the Contractor to obtain the fugitive dust plan requirements from the Utah Division of Air Quality and the SWPPP requirements from the Utah Department of Environmental Quality and submit the completed forms and pay any permit fee that may be required for this specific project. Failure to obtain the required permit may result in work stoppage and/or fines from the regulating authority that will be the sole responsibility of the Contractor. Any delay to the project as a result of any such failure to obtain the permit or noncompliance with the permit shall not be eligible for any extension in the Contract Time.

11. Right to Reject Bids

DFCM reserves the right to reject any or all Bids.

12. Time is of the Essence

Time is of the essence in regard to all the requirements of the Contract Documents.

13. Withdrawal of Bids

Bids may be withdrawn on written request received from bidder prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

14. Product Approvals

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the drawings and specifications and are compatible with the intent and purpose of

the design, subject to the written approval of the A/E. Such written approval must occur prior to the deadline established for the last scheduled addenda to be issued. The A/E's written approval will be in an issued addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the A/E.

15. Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors

Contractors shall respond promptly to any inquiry in writing by DFCM to any concern of financial responsibility of the contractor, subcontractor or sub-subcontractor.

16. Debarment

By submitting a bid, the Contractor certifies that neither it nor its principals, including project and site managers, have been, or are under consideration for, debarment or suspension, or any action that would exclude such from participation in a construction contract by any governmental department or agency. If the Contractor cannot certify this statement, attach to the bid a detailed written explanation which must be reviewed and approved by DFCM as part of the requirements for award of the Project.

BID BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of \$ _____ (5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the _____ Project.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

PROVIDED, HOWEVER, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

DATED this _____ day of _____, 20_____.

Principal's name and address (if other than a corporation):

By: _____

Title: _____

Principal's name and address (if a corporation):

By: _____

Title: _____
(Affix Corporate Seal)

Surety's name and address:

By: _____
Attorney-in-Fact (Affix Corporate Seal)

STATE OF _____)
COUNTY OF _____) ss.

On this ____ day of _____, 20_____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.

My Commission Expires: _____

Resides at: _____

Agency: _____
Agent: _____
Address: _____
Phone: _____

NOTARY PUBLIC

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

**Division of Facilities Construction and****INSTRUCTIONS AND SUBCONTRACTORS LIST FORM**

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, based on the following:

DOLLAR AMOUNTS FOR LISTING

PROJECTS UNDER \$500,000: ALL FIRST-TIER SUBS \$20,000 OR OVER MUST BE LISTED
PROJECTS \$500,000 OR MORE: ALL FIRST-TIER SUBS \$35,000 OR OVER MUST BE LISTED

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- If there are no subcontractors for the job that are required to be reported by State law (either because there are no subcontractors that will be used on the project or because there are no first-tier subcontractors over the dollar amounts referred to above), then you do not need to submit a sublist. If you do not submit a sublist, it will be deemed to be a representation by you that there are no subcontractors on the job that are required to be reported under State law. At any time, DFCM reserves the right to inquire, for security purposes, as to the identification of the subcontractors at any tier that will be on the worksite.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

'SPECIAL EXCEPTION':

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A. Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

GROUND FOR DISQUALIFICATION:

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM
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such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

- (1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
- (2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
- (3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
- (4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
- (5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
- (6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

EXAMPLE:

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, “SELF” OR “SPECIAL EXCEPTION”	SUBCONTRACTOR BID AMOUNT	CONTRACTOR LICENSE #
ELECTRICAL	ABCD Electric Inc.	\$350,000.00	123456789000
LANDSCAPING	“Self” *	\$300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	\$298,000.00	987654321000
MECHANICAL	“Special Exception” (attach documentation)	Fixed at: \$350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

* Bidders may list “self”, but it is not required.

**PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS
SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.**

**SUBCONTRACTORS LIST**

FAX TO 801-538-3677

PROJECT TITLE: _____

Caution: You must read and comply fully with instructions.

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONT. LICENSE #

We certify that:

1. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed "Self" or "Special Exception" in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

FIRM: _____

DATE: _____

SIGNED BY: _____

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR OWNER'S REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY OWNER. ATTACH A SECOND PAGE IF NECESSARY.

CONTRACTOR'S AGREEMENT

FOR:

THIS CONTRACTOR'S AGREEMENT, made and entered into this ____ day of _____, 20__, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and _____, incorporated in the State of _____ and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is _____.

WITNESSETH: WHEREAS, DFCM intends to have Work performed at _____.

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

ARTICLE 1. SCOPE OF WORK. The Work to be performed shall be in accordance with the Contract Documents prepared by _____ and entitled "_____"

The DFCM General Conditions ("General Conditions") dated May 25, 2005 and Supplemental General Conditions dated July 15, 2008 ("also referred to as General Conditions") on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

ARTICLE 2. CONTRACT SUM. The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of _____ DOLLARS AND NO CENTS (\$_____.00), which is the base bid, and which sum also includes the cost of a 100% Performance Bond and a 100%

CONTRACTOR'S AGREEMENT
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Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY. The Work shall be Substantially Complete by _____. Contractor agrees to pay liquidated damages in the amount of \$_____ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

ARTICLE 4. CONTRACT DOCUMENTS. The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Invitation to Bid, Instructions to Bidders/ Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

ARTICLE 5. PAYMENT. The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the Contractor requests payment and agrees to

safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor's obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

ARTICLE 6. INDEBTEDNESS. Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

ARTICLE 7. ADDITIONAL WORK. It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

ARTICLE 8. INSPECTIONS. The Work shall be inspected for acceptance in accordance with the General Conditions.

ARTICLE 9. DISPUTES. Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT. This Contractor's Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF. The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

ARTICLE 12. INDEMNIFICATION. The Contractor shall comply with the indemnification provisions of the General Conditions.

ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT. The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor's Agreement. The Contractor shall not assign this Contractor's Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor's Agreement, without prior written consent of the DFCM.

ARTICLE 14. RELATIONSHIP OF THE PARTIES. The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT. Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

ARTICLE 16. ATTORNEY FEES AND COSTS. Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.

CONTRACTOR'S AGREEMENT
PAGE NO. 5

IN WITNESS WHEREOF, the parties hereto have executed this Contractor's Agreement on the day and year stated hereinabove.

CONTRACTOR: _____

Signature Date

Title: _____

State of _____)
_____)
County of _____)

Please type/print name clearly

On this ____ day of _____, 20____, personally appeared before me, _____, whose identity is personally known to me (or proved to me on the basis of satisfactory evidence) and who by me duly sworn (or affirmed), did say that he (she) is the _____ (title or office) of the firm and that said document was signed by him (her) in behalf of said firm.

(SEAL)

Notary Public

My Commission Expires _____

APPROVED AS TO AVAILABILITY
OF FUNDS:

David D. Williams, Jr. Date
DFCM Administrative Services Director

**DIVISION OF FACILITIES
CONSTRUCTION AND MANAGEMENT**

Lynn A. Hinrichs Date
Assistant Director Construction Management

APPROVED AS TO FORM:
ATTORNEY GENERAL
July 15, 2008
By: Alan S. Bachman
Asst Attorney General

APPROVED FOR EXPENDITURE:

Division of Finance Date

PERFORMANCE BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That _____ hereinafter referred to as the "Principal" and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee," in the amount of _____ DOLLARS (\$ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____, for the approximate sum of _____ Dollars (\$ _____), which Contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

PRINCIPAL:

By: _____

(Seal)

Title: _____

WITNESS OR ATTESTATION:

SURETY:

By: _____

Attorney-in-Fact

(Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20____.

My commission expires: _____

Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

PAYMENT BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____ authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of _____, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of _____ Dollars (\$ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____ for the approximate sum of _____ Dollars (\$ _____), which contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, 1953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

PRINCIPAL:

By: _____
(Seal)

Title: _____

WITNESS OR ATTESTATION:

SURETY:

By: _____
Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20____.

My commission expires: _____
Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

**CERTIFICATE OF SUBSTANTIAL COMPLETION**

PROJECT _____ PROJECT NO: _____

AGENCY/INSTITUTION _____

AREA ACCEPTED _____

The Work performed under the subject Contract has been reviewed on this date and found to be Substantially Completed as defined in the General Conditions; including that the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the State of Utah can occupy the Project or specified area of the Project for the use for which it is intended.

The DFCM - (Owner) accepts the Project or specified area of the Project as Substantially Complete and will assume full possession of the Project or specified area of the Project at _____ (time) on _____ (date).

The DFCM accepts the Project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the Project subject to the itemized responsibilities and/or exceptions noted below:

The Owner acknowledges receipt of the following closeout and transition materials:

As-built Drawings

O & M Manuals

Warranty Documents

Completion of Training
Requirements

A list of items to be completed or corrected (Punch List) is attached hereto. The failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents, including authorized changes thereof. The amount of _____ (Twice the value of the punch list work) shall be retained to assure the completion of the punch list work.

The Contractor shall complete or correct the Work on the list of (Punch List) items appended hereto within _____ calendar days from the above date of issuance of this Certificate. The amount withheld pending completion of the list of items noted and agreed to shall be: \$ _____. If the list of items is not completed within the time allotted the Owner has the right to be compensated for the delays and/or complete the work with the help of independent contractor at the expense of the retained project funds. If the retained project funds are insufficient to cover the delay/completion damages, the Owner shall be promptly reimbursed for the balance of the funds needed to compensate the Owner.

CONTRACTOR (include name of firm) by: _____
(Signature) DATE

A/E (include name of firm) by: _____
(Signature) DATE

USING INSTITUTION OR AGENCY by: _____
(Signature) DATE

DFCM (Owner) by: _____
(Signature) DATE

**General Contractor Performance Rating Form**

Project Name:		DFCM Project#	
Contractor: (ABC Construction, John Doe, 111-111-1111)	A/E: (ABC Architects, Jane Doe, 222-222-2222)	Original Contract Amount:	Final Contract Amount:
DFCM Project Manager:		Contract Date:	
Completion Date:		Date of Rating:	

Rating Guideline	QUALITY OF PRODUCT OR SERVICES	COST CONTROL	TIMELINESS OF PERFORMANCE	BUSINESS RELATIONS
5-Exceptional	Contractor has demonstrated an exceptional performance level in any of the above four categories that justifies adding a point to the score. Contractor performance clearly exceeds the performance levels described as "Very Good"			
4-Very Good	Contractor is in compliance with contract requirements and/or delivers quality product/service.	Contractor is effective in managing costs and submits current, accurate, and complete billings	Contractor is effective in meeting milestones and delivery schedule	Response to inquiries, technical/service/administrative issues is effective
3-Satisfactory	Minor inefficiencies/errors have been identified	Contractor is usually effective in managing cost	Contractor is usually effective in meeting milestones and delivery schedules	Response to inquires technical/service/administrative issues is somewhat effective
2-Marginal	Major problems have been encountered	Contractor is having major difficulty managing cost effectively	Contractor is having major difficulty meeting milestones and delivery schedule	Response to inquiries, technical/service/administrative issues is marginally effective
1-Unsatisfactory	Contractor is not in compliance and is jeopardizing achievement of contract objectives	Contractor is unable to manage costs effectively	Contractor delays are jeopardizing performance of contract objectives	Response to inquiries, technical/service/administrative issues is not effective

1. Rate Contractors quality of workmanship, management of sub contractor performance, project cleanliness, organization and safety requirement.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

2. Rate Contractor administration of project costs, change orders and financial management of the project budget.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

3. Rate Contractor's performance and adherence to Project Schedule, delay procedures and requirements of substantial completion, inspection and punch-list performance.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

4. Evaluate performance of contractor management team including project manager, engineer and superintendent also include in the rating team's ability to work well with owner, user agency and consultants.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

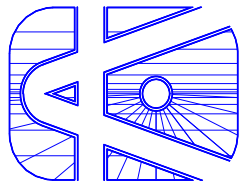
5. Rate success of Contractor's management plan, completion of the plans mitigation of project risks and performance of value engineering concepts.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

Signed by:	Date:	Mean Score

Additional Comments:

PROJECT MANUAL

YUBA RESTROOM DESIGN YUBA LAKE STATE PARK OASIS CAMPGROUND LEVAN, UTAH DFCM PROJECT NUMBER 07347510 LKS #0720



L. K. SORENSEN ARCHITECTS, INC.
1332 DUEHL CIRCLE
SALT LAKE CITY, UTAH 84123
(801) 262-9393 fax (801) 262-3511

**PROJECT MANUAL INDEX
YUBA RESTROOM DESIGN
PROJECT NUMBER 07347510**

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EP101 POWER & LIGHTING PLANS

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work under separate contracts.
 - 5. Access to site.
 - 6. Coordination with occupants.
 - 7. Work restrictions.
 - 8. Specification and drawing conventions.

1.2 PROJECT INFORMATION

- A. Project Identification: Yuba Restroom Design, Project Number 07347510.
 - 1. Project Location: Yuba State Park Oasis Campground.
- B. Owner: DFCM .
 - 1. Owner's Representative: DFCM
- C. Architect: L.K. Sorensen Associates, Inc.,
1332 Duehl Circle, Salt Lake City, Utah 84123,
801-262-9393, 801-262-3511 (Fax)
Email:Keith @ lksorensenarchitect.com

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of the Project is defined by the Contract Documents and consists of the following:
 - 1. Demolition and removal of existing toilet/shower building. Removal of existing camping improvements to prepare for construction of new septic tank and drain field system. New concrete walks, curb and gutter, pavement repair, and installation of utility systems from existing service lines. Rehabilitation of site after construction.

Construction of a new 896 s.f. approximate area building including concrete footings, foundations and floor slabs. Masonry wall construction with pre-fabricated wood roof framing system. Factory finished metal roofing, fascia and soffit. Cultured stone and decorative block exterior finish. Metal doors and frames and aluminum windows. Ceramic tile and FRP interior finish with some painted surfaces. Toilet accessories and other specialties. Plumbing, ventilation and electrical pwer and lighting systems. All work as shown on the drawings or as required.

1.4 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

- B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations.

1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours:
 - 1. 7:00 a.m. to 6 p.m. Monday thru Saturday. Upon arrangements with Owner's Representative.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1.7 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on the Drawings are described in detail in the Specifications. One or more of the following are used on the Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
 - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 - 5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - 6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 - 7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Progress payments shall be submitted to Architect by the 10th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in the Project Manual.
- F. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule (preliminary if not final).
 4. Schedule of unit prices.
 5. Submittal schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
 - J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
 - K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707-1994, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Requests for Information (RFIs).
 - 2. Project Web site.
 - 3. Project meetings.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information from each other during construction.

1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities[**and activities of other contractors**] to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.
 - 9. Project closeout activities.

1.4 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Architect.
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.
 - 8. Specification Section number and title and related paragraphs, as appropriate.
 - 9. Drawing number and detail references, as appropriate.
 - 10. Field dimensions and conditions, as appropriate.
 - 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 12. Contractor's signature.
 - 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 - 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 - 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 - 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 1 Section "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 7 days of receipt of the RFI response.
- E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Include the following:
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.5 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Sustainable design requirements.
 - l. Preparation of record documents.
 - m. Use of the premises.
 - n. Work restrictions.
 - o. Working hours.
 - p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.

- w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
- 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written recommendations.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: Conduct progress meetings at weekly intervals.
 - 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Daily construction reports.
 - 3. Field condition reports.
- B. Related Section:
 - 1. Division 01 Section "Multiple Contract Summary" for preparing a combined Contractor's Construction Schedule.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of the Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- C. Daily Construction Reports: Submit at monthly intervals.
- D. Field Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include not less than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 20 days for punch list and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Seasonal variations.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Utilize acceptable to architect, for Windows XP operating system.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.

- B. Start-up Network Diagram: Submit diagram within 14 days of date established for commencement of the Work. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- E. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Average size of workforce.
 9. Dollar value of activity (coordinated with the schedule of values).
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.

5. Changes in the critical path.
6. Changes in the Contract Time.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events.
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule with pay request.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections:
 - 1. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 2. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 4. Division 01 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.
 - 1. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

- a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
- D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Provide a space approximately **6 by 8 inches (150 by 200 mm)** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 - 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Other necessary identification.
- E. Options: Identify options requiring selection by the Architect.
- F. Deviations: Identify deviations from the Contract Documents on submittals.
- G. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
- H. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.
 - 1. Transmittal Form: Use form acceptable to Architect.
 - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on

previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- K. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements:
 - 1. Action Submittals: Submit four paper copies of each submittal, unless otherwise indicated. Architect will return two copies.
 - 2. Informational Submittals: Submit four paper copies of each submittal, unless otherwise indicated. Architect will not return copies.
 - 3. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
 - 4. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.

- d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 5. Submit Product Data concurrent with Samples.
 - 6. Submit Product Data in the following format:
 - a. Four paper copies of Product Data, unless otherwise indicated. Architect, will return two copies.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
- 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches (215 by 280 mm) but no larger than 24 by 36 inches**.
 - 3. Submit Shop Drawings in the following format:
 - a. Four opaque copies of each submittal. Architect will retain two copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
- 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - 3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, will return submittal with options selected.

- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Submit product schedule in the following format:
 - a. Four paper copies of product schedule or list, unless otherwise indicated. Architect, will return two copies.
- F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- G. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- H. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.
 - 1. Submit subcontract list in the following format:
 - a. Number of Copies: Four paper copies of subcontractor list, unless otherwise indicated. Architect, will return two copies.
- J. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- R. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- T. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."
- U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- W. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- X. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit four paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. All testing, specimen testing, and other quality control requirements shall be arranged, provided, coordinated and paid for by the contractor.
- C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- D. Related Sections:
 - 1. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- D. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade or trades.
- H. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
 1. Name, address, and telephone number of representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 5. Other required items indicated in individual Specification Sections.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - d. When testing is complete, remove test specimens, assemblies, mockups, do not reuse products on Project.
 - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests

and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.6 QUALITY CONTROL

- A. Contractor Responsibilities: Tests and inspections are Contractor's responsibility including payment for required services. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Engage a qualified testing agency to perform these quality-control services.
 - 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 - 3. Submit a certified written report, in duplicate, of each quality-control service to the Architect.
 - 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- B. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform any duties of Contractor.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.

- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.7 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Contractor will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction.
- B. Special Tests and Inspections: Conducted by a qualified testing agency **or** special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 - 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 - 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 - 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 - 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 - 6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AHA	American Hardboard Association (Now part of CPA)
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)
ALSC	American Lumber Standard Committee, Incorporated
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute

AOSA	Association of Official Seed Analysts, Inc.
APA	Architectural Precast Association
APA	APA - The Engineered Wood Association
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASCE	American Society of Civil Engineers
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	ASME International (American Society of Mechanical Engineers International)
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	Association of the Wall and Ceiling Industry
AWCMA	American Window Covering Manufacturers Association (Now WCMA)
AWI	Architectural Woodwork Institute
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association)
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI, Inc.
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
BWF	Badminton World Federation (Formerly: IBF - International Badminton Federation)
CCC	Carpet Cushion Council

CDA	Copper Development Association
CEA	Canadian Electricity Association
CEA	Consumer Electronics Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CIMA	Cellulose Insulation Manufacturers Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute
CRRC	Cool Roof Rating Council
CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CRI	Carpet and Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSA	CSA International (Formerly: IAS - International Approval Services)
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DHI	Door and Hardware Institute
EIA	Electronic Industries Alliance
EIMA	EIFS Industry Members Association
EJCDC	Engineers Joint Contract Documents Committee
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association (Electrostatic Discharge Association)
ETL SEMCO	Intertek ETL SEMCO (Formerly: ITS - Intertek Testing Service NA)
FIBA	Federation Internationale de Basketball (The International Basketball Federation)

FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FM Approvals	FM Approvals LLC
FM Global	FM Global (Formerly: FMG - FM Global)
FMRC	Factory Mutual Research (Now FM Global)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Part of GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
IAS	International Approval Services (Now CSA International)
IBF	International Badminton Federation (Now BWF)
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.

ISO	International Organization for Standardization Available from ANSI
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek Testing Service NA (Now ETL SEMCO)
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association, Inc.
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers
NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association

NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)
NOMMA	National Ornamental & Miscellaneous Metals Association
NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Now ITS)
PCI	Precast/Prestressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service

SAE	SAE International
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)
SGCC	Safety Glazing Certification Council
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc. (Now TCNA)
TCNA	Tile Council of North America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance
TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute

UL	Underwriters Laboratories Inc.
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)
WMMPA	Wood Moulding & Millwork Producers Association
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council
ICC-ES	ICC Evaluation Service, Inc.
UBC	Uniform Building Code (See ICC)

- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers
CPSC	Consumer Product Safety Commission
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
EPA	Environmental Protection Agency

FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FDA	Food and Drug Administration
GSA	General Services Administration
HUD	Department of Housing and Urban Development
LBL	Lawrence Berkeley National Laboratory
NCHRP	National Cooperative Highway Research Program (See TRB)
NIST	National Institute of Standards and Technology
OSHA	Occupational Safety & Health Administration
PBS	Public Buildings Service (See GSA)
PHS	Office of Public Health and Science
RUS	Rural Utilities Service (See USDA)
SD	State Department
TRB	Transportation Research Board
USDA	Department of Agriculture
USPS	Postal Service

- E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board
CFR	Code of Federal Regulations Available from Government Printing Office
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point
DSCC	Defense Supply Center Columbus (See FS)
FED-STD	Federal Standard (See FS)
FS	Federal Specification Available from Department of Defense Single Stock Point

Available from Defense Standardization Program

Available from General Services Administration

Available from National Institute of Building Sciences

FTMS Federal Test Method Standard
(See FS)

MIL (See MILSPEC)

MIL-STD (See MILSPEC)

MILSPEC Military Specification and Standards
Available from Department of Defense Single Stock Point

UFAS Uniform Federal Accessibility Standards
Available from Access Board

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation

CCR California Code of Regulations

CPUC California Public Utilities Commission

TFS Texas Forest Service
Forest Resource Development

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum **2-inch (50-mm)**, **0.148-inch- (3.8-mm-)** thick, galvanized steel, chain-link fabric fencing; minimum **6 feet (1.8 m)** high with galvanized steel pipe posts; minimum **2-3/8-inch- (60-mm-)** OD line posts and **2-7/8-inch- (73-mm-)** OD corner and pull posts, with **1-5/8-inch- (42-mm-)** OD top and bottom rails. Provide [**concrete**] [**galvanized steel**] bases for supporting posts.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to system indicated as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- F. Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 1. Install electric power service underground, unless otherwise indicated.
 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Architect's office.
 - e. Engineers' offices.
 - f. Owner's office.
 - g. Principal subcontractors' field and home offices.
 2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within **30 feet (9 m)** of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas on Drawings.
1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.
- C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
 2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
 3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
 4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

- B. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to **[erosion- and sedimentation-control Drawings] [requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent]**.
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
- F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- G. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- H. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Section:
 - 1. Division 01 Section "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 10 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.

2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. Refer to Divisions 02 through 49. Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Sections:
 - 1. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 2. Division 07 Section "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- C. Certified Surveys: Submit four copies signed by land surveyor.

1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.4 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, utilize products for patching that comply with requirements of Division 01 Section "Sustainable Design Requirements."
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 3. Inform installers of lines and levels to which they must comply.
 4. Check the location, level and plumb, of every major element as the Work progresses.
 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name

and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Existing Utility Services: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

- 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
- B. Related Sections:
 - 1. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 2. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
 - 3. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
 - 7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 8. Complete startup testing of systems.
 - 9. Submit test/adjust/balance records.
 - 10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 11. Advise Owner of changeover in heat and other utilities.
 - 12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 13. Complete final cleaning requirements, including touchup painting.
 - 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled

requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.3 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 1. Organize list of spaces in sequential order,
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Submit list of incomplete items in the following format:
 - a. Four paper copies, unless otherwise indicated. Architect will return two copies.

1.5 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
1. Use cleaning products that meet Green Seal GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- j. Remove labels that are not permanent.
- k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
 - 1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.
- l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
- n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- p. Leave Project clean and ready for occupancy.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operations and Maintenance manuals for the care and maintenance of materials, finishes, systems and equipment.
- B. See Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Name and address of Architect.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
 - 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

- a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
- b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and equipment descriptions, operating standards, operating procedures, operating logs, wiring and control diagrams, and license requirements.
- B. Descriptions: Include the following:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include start-up, break-in, and control procedures; stopping and normal shutdown instructions; routine, normal, seasonal, and weekend operating instructions; and required sequences for electric or electronic systems.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.3 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and inspection procedures, types of cleaning agents, methods of cleaning, schedule for cleaning and maintenance, and repair instructions.

- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including maintenance instructions, drawings and diagrams for maintenance, nomenclature of parts and components, and recommended spare parts for each component part or piece of equipment:
- D. Maintenance Procedures: Include test and inspection instructions, troubleshooting guide, disassembly instructions, and adjusting instructions that detail essential maintenance procedures:
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- C. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence

and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
- D. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
- B. See Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
- C. See Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set(s) of marked-up Record Prints.
 - 2. Number of Copies: Submit copies of Record Drawings as follows:
 - a. Submit **one** set of marked-up Record Prints.
- B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings.
 - 1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - 2. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
 - 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 - 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

- B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 - 1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 - 4. Note related Change Orders and Record Drawings where applicable.

2.3 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839

SECTION 031000 - CONCRETE FORM WORK

1.1 GENERAL

A. Related Work Described Elsewhere:

- | | | |
|----|------------------------|---|
| 1. | Concrete reinforcement | Section 032000 |
| 2. | Concrete | Section 033000 |
| 3. | Embedded metal items | Section 055000 |
| 4. | Other items | Mechanical Division 22 & 23
Electrical Division 26 |

B. Qualifications of Workman: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed, who shall direct all work performed under this section.

C. Codes and Standards (latest edition): In addition to complying with all pertinent codes and regulations including the 2006 edition of the INTERNATIONAL BUILDING CODE, comply with all pertinent recommendations contained in "Recommended Practice for Concrete FORM WORK", publication ACI 347 of the American Concrete Institute, latest edition.

1. Where provisions of pertinent codes and standards conflict with the requirements of this Section of these Specifications the more stringent provisions shall govern.

D. Protection: Use all means necessary to protect FORM WORK materials before, during and after installation and to protect the installed work and materials of all other trades.

E. Placements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional costs to the Owner.

1.2 PRODUCTS

A. Products: Use approved removable panel type metal forms. Recondition and lean before reusing. Do not oil or apply material which will stain exposed concrete.

1. All form sealers shall be first quality of their respective kinds and subject to the approval of the Owner containing no oil or paraffin.

B. Ties and Spreaders: All form ties shall be AA type which does not leave an open hole through the concrete and which permits neat and solid patching at every hole. Ties shall have a 1 ½" break back.

1. When forms are removed, all metal shall be not less than one inch from the surface.
2. Do not use wire ties and wood spreaders.
3. Alternate forming systems may be used subject to the approval of the Architect.
4. All other materials, not specifically described but required for proper completion of concrete FORM WORK, shall be as selected by the Contractor subject to the advance approval of the Architect.

1.3 EXECUTION

A. Execution: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.

1. Verify that forms may be constructed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.
 2. In the event of discrepancy, immediately notify the Architect.
 3. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- B. Construction of Forms: Construct all required forms to be substantial, sufficiently tight to prevent leakage of mortar, and able to prevent excessive deflection when filled with wet concrete.
1. Form all footings.
 2. Form required for all cast-in-place concrete to the shapes, sizes, lines, and dimensions indicated on the Drawings.
 3. Exercise particular care in the layout of forms to avoid necessity for cutting of concrete after it is in place.
 4. Make proper provision for all openings, offsets, recesses, anchorage, blocking, and other features of the work as shown or required.
 5. Perform all forming required for work of other trades and do all cutting and repairing of forms required to permit such installation.
 6. Carefully examine the Drawings and Specifications and consult with other trades as required relative to provision for openings, reglets, chases, and other items in the forms.
 7. Set all required steel frames, angles, grilles, bolts, inserts, and other such items required to be anchored in the concrete before the concrete is placed.
 8. Properly brace and tie the forms together so as to maintain position and shape and to ensure safety to personnel.
 9. Construct all bracing, supporting members, and centering of ample size and strength to safely carry, without excessive deflection all dead and live loads to which they may be subjected.
 10. Properly space the forms apart and securely tie them together, using metal spreader ties that give positive tying and accurate spreading.
 11. Construct all forms straight, true, plumb, and square within a tolerance horizontally of one in 200 and tolerance vertically of one in 500.
 12. Keep forms sufficiently wetted to prevent joints opening up before concrete is placed.
 13. During pour, maintain continuous surveillance to adjust for horizontal and vertical form deflections.
- C. Footing Forms: All footing forms shall be wood unless otherwise specifically approved by the Architect.
- D. Re-Use of Forms: Re-use of wood forms shall be subject to advance approval of the Owner.
1. Except as specifically approved in advance by the Architect, re-use of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtainable if all forms were new.
 2. Except as specifically approved in advance by the Architect re-use of forms shall in no way impart less structural stability to the forms nor less acceptable appearance to finish concrete.
 3. Wood forms shall not be re-used where concrete is exposed.
- E. Removal of Forms: In general side forms of footings may be removed after structural stability is gained, but surfaces must be coated with curing compound or continuously damp earth.
1. Use all means necessary to protect workmen, passers-by, the installed work and materials of other trades, and the complete safety of the structure.
 2. Cut nails and tie wires or form ties off flush, and leave all surfaces smooth and clean.
 3. Remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surface and pointing up and rubbing the resulting pockets to match the surrounding areas.
 4. Flush all holes resulting from the use of spreader rods and sleeve nuts, using water, and then solidly pack throughout the wall thickness with cement grout applied under pressure by

means of a grouting gun, grout shall be one part Portland cement to 2 ½ parts sand, apply grout immediately after removing forms.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCEMENT

1.1 GENERAL

- A. Related Work Described Elsewhere:
- | | | |
|----|-----------------------------------|----------------|
| 1. | Placement of other embedded items | Section 031000 |
| 2. | Cast-in-place Concrete | Section 033000 |
- B. Qualifications of Workmen: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the type of materials being installed and the best methods for their installation and who shall direct all work performed under this section.
1. Conform with General Notes in Contract Documents.
 2. Codes and Standards (latest edition): In addition to complying with all pertinent codes, ACI 318-83 and 2006 International Building Code and regulations, comply with all pertinent recommendations contained in "Manual of Standard Practice for Detailing Reinforced Concrete Structures", publication ACI 315 of the American Concrete Institute, latest edition.
 3. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent provisions shall govern.
- C. Shop Drawings: Within 10 days after award of Contract, and before any concrete reinforcement materials are delivered to the job site, submit Shop Drawings to the Architect in accordance with Section 01300 of these Specifications.
1. Do not deliver concrete reinforcement to the job site until receipt of Shop Drawings approval from the Architect.
- D. Samples and Certificates: Provide all data and access required for testing as described in Section 01400 of these Specifications.
- E. Product Protection: Use all means necessary to protect concrete reinforcement before, during, and after installation, and to protect the installed work and materials of all other trades.
1. Store in a manner to prevent excessive rusting and fouling with dirt, grease, and other bond-breaking coatings.
 2. Use all necessary precautions to maintain identification after the bundled are broken.
- G. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1.2 PRODUCTS:

- A. Concrete Reinforcement: All concrete reinforcement materials shall be new, free from rust, and complying with the following reference standards:
1. Bars for reinforcement: "Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement", ASTM A-615-81, grade 60, unless noted otherwise in general notes.
 2. Wire fabric: Specification for Welded Steel Wire Fabric for Concrete Reinforcement ", ASTM A-185.

3. All other materials not specifically described but required for a complete and proper installation of concrete reinforcement shall be as selected by the Contractor subject to the approval of the Architect.

1.3 EXECUTION:

- A. Surface Conditions - Inspection: Prior to installation of the work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 1. Verify that concrete reinforcement may be installed in strict accordance with all pertinent codes and regulations, the approved Shop Drawings, and the original design.
- B. Bending: Fabricate all reinforcement in strict accordance with the approved Shop Drawings.
 1. Do not use bars with kinks or bends not shown on the Drawings or on the approved Shop Drawings.
 2. Do not bend or straighten steel in a manner that will injure the material.
 3. Bend all bars cold.
 4. Make bends for stirrups and ties around a pin having a diameter not less than four times the minimum thickness of the bar.
 5. Make for other bars, including hooks, around a pin having a diameter not less than six times the minimum thickness of the bar.
- C. Placing: Before the start of concrete placement, accurately place all concrete reinforcement positively securing and supporting by concrete blocks, metal chairs and spacers, or by metal hangers.
 1. Preserve clear space between bars of not less than the nominal diameter of round bars.
 2. In no case let the clear distance be less than 1 2 inch nor less than 1 1/3 times the maximum size of aggregate.
 3. Provide the following minimum concrete covering of reinforcement, unless noted otherwise.
 4. Concrete below ground
 5. deposited against forms Two (2) inches
 6. Concrete deposited against earth Three (3) inches
 7. Slabs on grade with mesh Two (2) inches
 8. Concrete elsewhere as indicated on the drawings or otherwise approved by the architect.
- D. Splicing Horizontal Bars: Place bars in horizontal members with minimum laps at splices sufficient to develop the strength of the bars.
 1. Bars may be wired together at laps except at points of support of the member, at which points preserve the clear space described above.
 2. Wherever possible, stagger the splices of adjacent bars.
 3. Splice 48 bar diameters in masonry unless otherwise noted, minimum 1'-6".
- E. Splicing wire fabric: Lap all splices in wire fabric at least one mesh wide.
- F. Other Splices: Make only those other splices that are indicated on the approved Shop Drawings or specifically approved by the Architect.
- G. Placing Dowels: Place all required steel dowels and securely anchor them into position before the concrete is placed.

- H. Obstructions: In the event conduits, piping inserts, sleeves, or any other items interfere with placing reinforcement as indicated on the Drawings or as otherwise required, immediately consult the Architect and obtain approval of new procedure before placing concrete.
- I. Support and Typing: Bars shall be double-loop tied and twisted at each perpendicular intersection with bars in the same plane.
 - 1. All reinforcing shall be supported and adjusted to exact heights before pouring commences.
 - 2. Support footing reinforcing on 2000 PSI concrete block chairs (4" x 4" maximum) or on property protected and anchored metal supports and tie in place.
 - 3. Mesh for slabs on grade shall be continuously hooked up to the slab centerline.
- J. Cleaning Reinforcement: Steel reinforcement, at the time concrete is placed around it, shall be free from rust scale, loose mill scale, oil paint, and all other coatings which will destroy or reduce bond between steel and concrete.
- K. Protection of Concrete: No aluminum conduit or product containing aluminum or any metal injurious to concrete shall be embedded in concrete.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

1.1 GENERAL

1. The General Provisions/Conditions and Division One apply to this section.
2. Work Included: Cast-in-place concrete required for this work is indicated on the Drawings and includes, but is not necessarily limited to:
 1. Site concrete work
 2. Footings and foundations
 3. Concrete walls
 4. Slabs on grade and suspended slabs
 5. Exterior flat work
3. Related work described elsewhere:
 1. Testing laboratory services: Section 014000
 2. Concrete form work: Section 031000
 3. Concrete reinforcement: Section 032000
4. Qualifications of workmen: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly trained and experienced in placing the types of concrete specified and who shall direct all work performed under this Section.
 1. For finishing of exposed surfaces of the concrete, use only thoroughly trained and experienced journeyman concrete finishers.
- E. Codes and Standards (latest edition): Comply with all pertinent recommendations of "Structural Concrete for Building" publication ACI 301, "Recommended practice for measuring, mixing, transporting and placing concrete" ACI 340 of the American Concrete Institute and the 2006 edition of the INTERNATIONAL BUILDING CODE.
 1. Concrete shall be "Ready Mix" type complying with ASTM C94-81 unless a higher standard is called for.
 2. Where provisions of pertinent codes and standards conflict with this Specification, the more stringent provisions shall govern.
6. Materials List: Within 10 days after award of Contract, and before any concrete is delivered to the job site, submit to the Owner, in accordance with General Conditions of these Specifications, a complete list of all materials proposed to be furnished and installed under this portion of the Work, showing manufacturer's name and catalog number of all items such as admixture and membrane, and the name and address of transit-mix concrete supplier.
- G. Transit-mix delivery slips: The following information shall be furnished on each and every delivery ticket for each and every load of ready-mix concrete.
 1. Number of cubic yards.
 2. The exact amount of cement (this can be indicated either by weight or quantity).
 3. The amount of mixing water, including moisture in aggregates (this can be indicated either by weight or quantity).
 4. If water is added at job site, note amount.
 5. Amount of slump in inches.
 6. Type of cement.
 7. Amount of air entrainment (if any) when delivered at job site.
 8. Do aggregates meet ASTM specified--yes or no. Indicated maximum size aggregate.
 9. Amount and brand (or ASTM) of admixture other than air entraining agent (if any).
 10. These tickets shall be given to the resident inspector and if he is not on the job, the

superintendent or foreman shall obtain these tickets and see that they are mailed to the Architect once a week. The foreman shall note location of concrete on job.

11. Keep a record at the job site showing time and place of each pour of concrete, together with transit-mix delivery slip certifying contents of the pour.
12. Make a record available to the Architect and Owner for his inspection upon request.
13. Upon completion of this portion of the Work, deliver the record and the delivery slips to the Architect.
14. Concrete delivered to the site not conforming to the requirements of this Specification will be rejected prior to - during - after placement as applicable without lost responsibility to owner, owner's representative and/or Architect.

8. Protection: Use all means necessary to protect cast-in-place concrete materials before, during, and after installation and to protect the installed work and materials of all other trades.

1. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner at no additional cost to the Owner.

1.2 PRODUCTS:

1. General: All concrete, unless otherwise specifically permitted by the Architect/Engineer, shall be transit-mixed in accordance with ASTM S-94-81.

1. The control of concrete production shall be under supervision of an approved testing laboratory selected and paid for as described in Section 01350 of these Specifications. This laboratory may inspect batched aggregates and transit-mixed concrete at the mixing plant and distribution plant.

2. Quality Control:

1. Sampling: ASTM C172
2. Slump: ASTM C143, minimum one test for each and every load at point of discharge.
3. Air Content: ASTM C173, minimum one for each set of compressive strength specimens.
4. All concrete, ASTM C39, minimum one set for each 10 cubic yards or fraction thereof for each class of concrete, shall have the following minimum compressive strength. Test one specimen at 7 days, one specimen at 28 days and retain one for later testing approved by the Architect. Comply with ASTM C31 for making and curing cylinders.

Location of concrete:	Min. psi @ 28 days:	Max. size aggregate:	Max. slump in inches:	Water/Cement Ratio:	Bags:
Footings	3000	1 inch	4	0.50	5-1/2
Foundation walls	4000	1 inch	4	0.45	6-1/2
Building slab on grade:	4000	3/4 inch	4	0.45	6-1/2
Exterior slabs & site work:	4000	3/4 inch	3	0.45	6-1/2
Suspended slabs on decking	4000	3/4 inch	3	0.45	6-1/2

Test results will be reported in writing to the Owner, Architect, Structural Engineer, Contractor and Concrete Producer on same day tests are made.

3. All cement shall be Portland cement conforming to ASTM C-150, type II, low alkali and shall be the product of one manufacturer, the temperature of cement delivered to the plant shall not exceed 150 degrees F.
4. All aggregates shall conform to ASTM C-33-82, uniformly graded as follows:
 1. Flat work: 1/4" minimum to 3/4" maximum
 2. All other: 1/4" minimum to 1" maximum

5. Coarse aggregate shall be crushed with a minimum of three (3) crushed faces and a minimum cleanliness value of 75%. It shall be composed of hard rocks containing no more than 10% shale or other soft materials. No measurable amount of included alkali will be acceptable.
6. Fine aggregate shall contain a minimum of 75% sharp, washed sand. Sand shall pass a 3/8" sieve and be graded coarse to fine.
7. All water shall be clean and free from deleterious matter, drinkable.
8. Air-Entraining Admixture: ASTM C 260-77. 6-1/2% +/- 1-1/2% for 3/4" aggregate.
9. Water Reducing Admixture: ASTM C494-81. Only use admixtures which have been tested and accepted in mix designs, unless otherwise acceptable. Do not use calcium chloride.
 - a. Fly Ash Will Not Be Allowed
10. Concrete floor seal: Ashford Formula by Curecrete Chemical where finished flooring material is not required. Alternate materials will must receive approval by the Architect/Engineer prior to bidding.
 - a. Floor seal is not required where finished flooring is shown.
11. Membrane-Forming Curing Compound: ASTM C309-81, Type I.
12. Joint Fillers: See Division 7.
13. All other materials not specifically described but required for a complete and proper installation of cast-in-place concrete shall be as selected by the Contractor subject to the approval of the Architect.

1.3 EXECUTION:

- A. Inspection: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 1. Verify that all items to be embedded in concrete are in place.
 2. Verify that concrete may be placed to the lines and elevations indicated on the Drawings with all required clearance from reinforcements.
- B. Discrepancies: In the event of discrepancy, immediately notify the Owner.
 1. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
- C. PREPARATION: Remove all wood scraps and debris from the areas in which concrete will be placed.
 1. Thoroughly clean the areas to ensure proper placement and bonding of concrete.
 2. Thoroughly wet the forms (except in freezing weather), or oil them, remove all standing water.
 3. Thoroughly clean all transporting and handling equipment.
- D. Notification: Notify the Architect at least 48 hours before placing concrete and do not commence pours in inspector's absence unless granted permission from him. Place all concrete in forms within 1 hour after water added to mix.
- E. Concrete Placing Method: Convey concrete from mixer to place of final deposit by methods that will prevent separation and loss of materials.

1. For chuting, pumping, and pneumatically conveying concrete, use only equipment of such size and design as to ensure a practically continuous flow of concrete at the delivery end without loss or separation of materials.
 2. Do not overwork concrete nor allow water to sit on the surface.
 3. Do not dust the surface with cement.
 4. Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed. Place all embedded items. Place all concrete within 1 2 hours after water is added to mix.
 5. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is work around reinforcement and other embedded items and into all parts of forms. Do not use "gandy" or similar type tool on slabs. Maintain spare vibration on job. Do not vibrate forms or reinforcing.
 6. Do not use retempered concrete or concrete that has been contaminated by foreign materials.
- F. Make and locate construction joints so as to not impair the strength of the structure.
1. Place isolation and control joints in slabs, on-ground to stabilize differential settlement and random cracking.
 2. Obtain the Architect's approval of location of all construction joints and control joints in the Work prior to start of concrete placement.
- G. Finishing: Unless otherwise indicated on the Drawings, make all slabs even and uniform in appearance and where no slope is required, level within plus or minus 1/8 inch in ten feet.
1. Where floor drains or floor slopes are indicated, slope slabs uniformly to provide even fall for drainage, floors must completely drain.
 2. Trowel all interior slabs to a smooth, hard finish, free of trowel marks, for seal or resilient floor covering.
 3. Apply floor sealing agent in accordance with manufacturer's recommendations.
- H. Exterior Surface Finishes: Where "broom finish" is indicated on the Drawings, and where no other exterior slab finish is indicated on the Drawings, finish the exposed concrete surface by lightly combing with a medium stiff broom, after light troweling is completed, perpendicular to the direction of traffic.
1. Do not dust with Portland cement or work excessive fines to surface.
 2. Exposed foundation wall shall have a rubbed finish free of form. Patch any honeycomb (where allowed) and fill tie holes. Color is to match. Cure patching per PCA recommendations.
 3. Cure all interior slabs by fog mist until curing membrane has been installed.
 4. Immediately upon finishing a slab area, apply a fog mist above the finished concrete surface, using fog nozzles of a type approved by Architect to keep the air humid and to prevent loss of moisture from the concrete surface.
 5. Provide an appearance of wet sheen on the concrete but do not permit concentration of water in one place. Do not dust with cement or work excessive lines to surface.
 6. Continue fogging until membrane has been installed, minimum 7 days.
- I. Concrete floor seal shall be applied to all interior concrete slabs to be left exposed and the exterior concrete surfaces of the loading ramp and lube rack.
- J. Membrane-Forming Curing Compound shall be applied to all exterior concrete slabs.
- K. HOT WEATHER REQUIREMENTS: Comply with ACI 306R-78.
1. Do not use concrete with a placing temperature that will cause difficulty from loss of slump,

- flash set, or cold joints.
2. Provide and use all required windbreaks, fog sprays, and other devices to protect the concrete.
- L. COLD WEATHER REQUIREMENTS: Comply with ACI 305R-77.
1. Do not place concrete on earth when frost is present. Do not place in forms until all frost is melted from forms and reinforcing.
 2. If any concrete shows any evidence of freezing, such as sanding, flaking, or crumbing, the Owner can require all of that concrete to be replaced at no extra cost or extension of completion date.
 3. Protection methods and materials shall be approved by Architect.
 4. Below grade, manufactured insulating blankets are permissible for freeze protection above 25 degrees F outside ambient.
 5. Immediately after forms and curing membranes have been removed, inspect all concrete surfaces and patch all pour joints, voids, rock pockets, form tie holes, and other imperfections before the concrete is thoroughly dry.
 6. Do not patch until concrete has been inspected by the Architect.
- M. Patching Minor Defective Areas: Upon approval of Architect, chip away to a depth of about one inch, leaving edges perpendicular to the surface, wet the area to be patched and a space of at least six (6) inches wide around it to prevent water being absorbed out of the mortar.
1. Coat the area to be patched with cement wash consisting of neat cement and a solution of one part "Konset", or equal approved by the Architect, to four parts of water; apply the patching mortar immediately.
 2. Patching mortar shall consist of one part cement to three parts water, to a consistency as dry as possible within the requirements of handling and placing; thoroughly compact the mortar by ramming it into place.
 3. Screed off so as to leave the patch lightly higher than surrounding surfaces; leave undisturbed for a period of one to two hours to permit initial shrinkage, and then perform final finishing.
 4. Finish the patch to match adjacent surfaces and keep wet for at least three (3) days, provide and install required protective covering.
- N, Patching Major Defective Areas: (where allowed by the Architect). If the defects are serious or affect the strength of the structure, or if patching does not satisfactorily restore the quality and appearance of the surface, Architect may require "cement gun concrete" to be used or the concrete to be removed and replaced complete in accordance with the provisions of this Section; all at no additional cost to the Owner.
- O. TWO (2) YEAR WRITTEN GUARANTEE: Provide to OWNER a two year written guarantee, in a form approved by the Architect, at the Contractor's expense. Promptly remove and/or replace defective concrete occurring within two years after date of "substantial completion" at Contractor's expense, and as directed by Owner. Spalling, pitting and cracking of concrete shall be considered defective work.

END OF SECTION 03300

SECTION 044200 – EXTERIOR STONE CLADDING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes stone veneer in the following applications:
 - 1. Anchored to cold-formed metal framing and sheathing.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Stone Samples: For each color, grade, finish, and variety of stone required.
- C. Colored Mortar Samples: For each color required.
- D. Qualification Data: For Installer.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An installer who employs experienced stone masons and stone fitters who are skilled in installing stone veneer assemblies similar in material, design, and extent to those indicated for this Project and whose projects have a record of successful in-service performance.
- B. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
 - 1. Build mockups for each type of stone veneer assembly in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high by full thickness, including face and backup.

1.4 PROJECT CONDITIONS

- A. Protection of Stone Veneer Assemblies: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone veneer assemblies.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 STONE SOURCES

- A. Varieties and Sources: Subject to compliance with requirements, provide stone of the following variety and from the following source:

1. As selected by Architect from manufacturers full range of styles and colors.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color as selected by architect from full range of colors.

1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.

- B. Hydrated Lime: ASTM C 207, Type S.

- C. Masonry Cement: ASTM C 91.

- D. For pigmented mortar, use a colored cement formulation as required to produce color as selected from manufacturer's standard formulations.

1. **Available Products:**

- a. Colored Portland Cement-Lime Mix:

- 1) Blue Circle Cement; Eaglebond.
- 2) Glen-Gery Corporation; Color Mortar Blend.
- 3) Holnam, Inc.; Rainbow Mortamix Custom Color Cement/Lime.
- 4) Lafarge Corporation; Centurion Colorbond PL.
- 5) Lehigh Portland Cement Co.; Lehigh Custom Color Portland/Lime.
- 6) Riverton Corporation (The); Riverton Portland Cement Lime Custom Color.

- E. Aggregate: ASTM C 144 and as follows:

1. For pointing mortar, use aggregate graded with 100 percent passing **No. 16 (1.18-mm)** sieve.
2. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.

- F. Mortar Pigments: Natural or synthetic iron oxides, compounded for use in mortar mixes and with a record of satisfactory performance in stone masonry mortars.

1. Available Products:

- a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
- b. Davis Colors; True Tone Mortar Colors.
- c. Lafarge Corporation; Centurion Pigments.
- d. Solomon Colors; SGS Mortar Colors.

- G. Water: Potable.

2.3 VENEER ANCHORS

A. Materials:

1. Hot-Dip Galvanized Steel Wire: ASTM A 82, with ASTM A 153/A 153M, Class B-2.
2. Hot-Dip Galvanized Steel Sheet: ASTM A 366/A 366M, cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B-2.

B. Adjustable Veneer Anchors: 2-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall, for attachment over sheathing to wood or metal studs, and that are capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).

1. Seismic Veneer Anchors: Units with rib-stiffened, sheet metal anchor section with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot for a connector section designed to engage continuous wire embedded in the veneer mortar joint.

a. Available Products:

- 1) Dur-O-Wal, a Dayton Superior Company; D/A 213S.
- 2) Hohmann & Barnard, Inc.; DW-10-X-Seismiclip.
- 3) Masonry Reinforcing Corporation of America; RJ-711 with Wire-Bond Clip.

2.4 EMBEDDED FLASHING MATERIALS

A. Contractor's Option for Concealed Flashing: For flashing partly exposed to the exterior, use metal flashing specified above. For flashing not exposed to the exterior, use the following, unless otherwise indicated:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable and highly adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of 0.030 inch (0.8 mm).

a. Available Products:

- 1) Dur-O-Wal, a Dayton Superior Company; Dur-O-Barrier.
- 2) Grace, W. R. & Co., Construction Products Division; Perm-A-Barrier Wall Flashing.
- 3) Hohmann & Barnard, Inc.; Textroflash.
- 4) Polyguard Products, Inc.; Polyguard 300.
- 5) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
- 6) Williams Products, Inc.; Everlastic MF-40.

2.5 MISCELLANEOUS MASONRY ACCESSORIES

A. Weep Holes:

1. Round Plastic Tubing: Medium-density polyethylene, 3/8-inch (10-mm) OD by thickness of stone veneer assembly.
2. Wicking Material: Cotton or polyester rope, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity behind stone veneer assembly.

B. Cavity Drainage Material: As required by stone manufacturer.

2.6 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by stone producer.

2.7 STONE FABRICATION

- A. General: Fabricate stone in sizes and shapes necessary to comply with requirements indicated, including details on Drawings.
- B. Finish exposed faces and edges of stone to comply with requirements indicated for finish and to match approved samples and mockups.

2.8 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride.
 - 2. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.
- B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
 - 1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
 - 2. Mortar for Setting Stone: Type S.
 - 3. Mortar for Pointing Stone: Type N.
- C. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.

PART 3 - EXECUTION

3.1 SETTING OF STONE VENEER, GENERAL

- A. Accurately mark stud centerlines on face of building paper or building wrap before beginning stone installation.
- B. Perform necessary field cutting as stone is set. Use power saws to cut stone. Cut lines straight and true, with edges eased slightly to prevent snipping.
- C. Arrange and trim stone panels and install in accordance with manufacturers recommendations.
- D. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain bond alignment, if any.

- E. Install embedded flashing and weep holes at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
 - 1. At framed walls, extend flashing from exterior face of veneer, through the veneer, up the face of sheathing at least **8 inches (200 mm)**, and behind building paper or building wrap.
 - 2. Extend sheet metal flashing **1/2 inch (13 mm)** beyond face of masonry at exterior and turn flashing down to form a drip.
 - 3. Cut flashing flush with face of wall after masonry wall construction is completed.
- F. Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, and at flashing.
 - 1. Use round plastic tubing to form weep holes.
 - 2. Space weep holes formed from plastic tubing **16 inches (400 mm)** o.c.

3.2 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (10 mm in 6 m)**, or **1/2 inch in 40 feet (13 mm in 12 m)** or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed **1/4 inch in 20 feet (6 mm in 6 m)** or **1/2 inch in 40 feet (13 mm in 12 m)** or more.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed **1/4 inch in 20 feet (6 mm in 6 m)** or **1/2 inch in 40 feet (13 mm in 12 m)** or more.
- C. Variation of Linear Building Line: For position shown in plan, do not exceed **1/2 inch in 20 feet (13 mm in 6 m)** or **3/4 inch in 40 feet (19 mm in 12 m)** or more.

3.3 INSTALLATION OF ANCHORED STONE VENEER ASSEMBLIES

- A. Anchor stone veneer to cold-formed metal framing with seismic veneer anchors as follows:
 - 1. Fasten each anchor section through sheathing to framing with two screws.
 - 2. Embed connector section in mortar joints to within **1-1/2 inches (38 mm)** of face.
- B. Space veneer anchors not more than **18 inches (450 mm)** o.c. vertically and **32 inches (800 mm)** o.c. horizontally, with not less than 1 veneer anchor per **2.67 sq. ft. (0.25 sq. m)** of wall area. Install additional veneer anchors within **12 inches (300 mm)** of openings, sealant joints, and perimeter at intervals not exceeding **12 inches (300 mm)**.
- C. Set stone in full bed of mortar with full head joints, unless otherwise indicated. Build veneer anchors into mortar joints as stone is set.
- D. Fill space between back of veneer and building wrap with mortar as stone is set.
- E. Rake out joints for pointing with mortar to depth of not less than **1/2 inch (13 mm)**. Rake joints to uniform depths with square bottoms and clean sides.

3.4 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than **3/8 inch (10 mm)** deep until a uniform depth is formed.

- B. Point stone joints by placing and compacting pointing mortar in layers not more than **3/8 inch (10 mm)** deep. Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
 - 1. Joint Profile: Flush, with a **3/8-inch (10-mm)** half-round raised bead in middle of joint As indicated.

3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone veneer assemblies as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone veneer assemblies as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner.
 - 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
 - 5. Clean stone veneer assemblies by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.

3.6 EXCESS MATERIALS AND WASTE

- A. Disposal as Fill Material: Dispose of clean masonry waste, including mortar and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
 - 1. Do not dispose of masonry waste as fill within **18 inches (450 mm)** of finished grade.

END OF SECTION 044200

SECTION 048100 - UNIT MASONRY ASSEMBLIES

PART 1) - GENERAL

a) SUMMARY

- i) This Section includes unit masonry assemblies consisting of the following: Concrete masonry units.

b) SUBMITTALS

- i) Product Data: For each masonry unit, accessory, and other manufactured product indicated.
- ii) Shop Drawings: For masonry reinforcing bars; comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
- iii) Material Test Reports: For each type of masonry unit, mortar, and grout required.
- iv) Material Certificates: For each type of masonry unit required.

c) QUALITY ASSURANCE

- i) See Section 014000 - Quality Control.
 - (1) Concrete Masonry Units: ASTM C 140.
 - (2) Mortar: For properties per ASTM C 270.
 - (3) Grout: For compressive strength per ASTM C 1019.

d) PROJECT CONDITIONS

- i) Cold-Weather Requirements: Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.
- ii) Hot-Weather Requirements: When ambient temperature exceeds 100 deg F (38 deg C), or 90 deg F (32 deg C) with a wind velocity greater than 8 mph (13 km/h), do not spread mortar beds more than 48 inches (1200 mm) ahead of masonry. Set masonry units within one minute of spreading mortar.

PART 2) - PRODUCTS

a) MANUFACTURERS

- i) Products: Subject to compliance with requirements, provide one of the products specified.

b) MASONRY UNITS

- i) Concrete Masonry Units: ASTM C 90.
 - (1) Unit Compressive Strength: 2150-psi- (14.8-MPa-) minimum, average net-area compressive strength.
 - (2) Weight Classification: Normal weight.
 - (3) Type: II, nonmoisture-controlled units.

- (4) Special Shapes: Provide for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
- (5) Provide decorative 8"x8" scored unites where shown on drawings.

c) MORTAR AND GROUT MATERIALS

- i) Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
- ii) Hydrated Lime: ASTM C 207, Type S.
- iii) Mortar Cement: ASTM C 1329. Available Products.
- iv) Masonry Cement: ASTM C 91.
- v) Pigmented Mortar: Colored cement or cement-lime formulation as required to produce the color indicated.
 - (1) Colored Mortar Cement: Available Products: Grey to match Concrete Masonry Units.
- vi) Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - (1) Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- vii) Aggregate for Grout: ASTM C 404.
- viii) Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in
- ix) Water: Potable.

d) REINFORCING

- i) Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).
- ii) Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.
 - (1) Wire Size for Side Rods: W2.8 or 0.188-inch (4.8-mm) diameter.
 - (2) Wire Size for Cross Rods: W1.7 or 0.148-inch (3.8-mm) diameter.
 - (3) Single-Wythe Masonry: Use either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches (407 mm) o.c.

e) TIES AND ANCHORS

- i) Materials, General: As follows, unless otherwise indicated:
 - (1) Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for exterior walls and Class 1 coating for interior walls.

f) EMBEDDED FLASHING MATERIALS

- i) Metal Flashing and Accessories: Fabricated to complying with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

g) MISCELLANEOUS MASONRY ACCESSORIES

- i) Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; formulated from neoprene urethane or PVC.
- ii) Preformed Control-Joint Gaskets: Designed to fit standard sash block and to maintain lateral stability in masonry wall. Made from styrene-butadiene-rubber compound complying with ASTM D 2000, Designation M2AA-805.

h) INSULATION

- i) Loose-Granular Fill Insulation: Perlite complying with ASTM C 549, Type II or IV.

i) MASONRY CLEANERS

- i) Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.
- ii) Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

j) MORTAR AND GROUT MIXES

- i) General: Do not use admixtures, unless otherwise indicated. Do not use calcium chloride in mortar or grout.
- ii) Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification.
- iii) Grout for Unit Masonry: Comply with ASTM C 476.
 - (1) Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 5 of ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 - (2) Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

k) SOURCE QUALITY CONTROL

- i) See Section 014000 - Quality Control.
- ii) Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

PART 3) - EXECUTION

a) INSTALLATION, GENERAL

- i) Cut masonry units with motor-driven saws. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

- ii) Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - iii) Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:
 - (1) For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/4 inch in 20 feet (6 mm in 6 m)**, nor **1/2 inch (12 mm)** maximum.
 - (2) For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than **1/4 inch in 20 feet (6 mm in 6 m)**, nor **1/2 inch (12 mm)** maximum.
- b) LAYING MASONRY WALLS
- i) Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
 - ii) Bond Pattern for Exposed Masonry: Lay exposed masonry in running bond pattern; do not use units with less than nominal **4-inch (100-mm)** horizontal face dimensions at corners or jambs.
 - iii) Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
 - iv) Fill cores in hollow concrete masonry units with grout **24 inches (600 mm)** under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.
- c) MORTAR BEDDING AND JOINTING
- i) Lay hollow masonry units as follows:
 - (1) With full mortar coverage on horizontal and vertical face shells.
 - (2) Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
 - (3) For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.
 - ii) Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than the joint thickness, unless otherwise indicated.
- d) MASONRY JOINT REINFORCEMENT
- i) Provide continuous masonry joint reinforcement as indicated. Install with a minimum cover of **5/8 inch (16 mm)** on exterior side of walls, **1/2 inch (13 mm)** elsewhere. Lap reinforcement a minimum of **6 inches (150 mm)**.
 - ii) Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections.
- e) ANCHORING MASONRY
- i) Anchor masonry to structural members where masonry abuts or faces structural members in accordance with the structural drawings.
- f) LINTELS

- i) Provide masonry lintels where shown.

g) REINFORCED UNIT MASONRY INSTALLATION

- i) Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
 - (1) Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- ii) Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- iii) Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
 - (1) Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

h) FIELD QUALITY CONTROL

- i) See section 014000 - Quality Control.
 - (1) Testing Frequency: Tests and Evaluations listed in these subparagraphs will be performed during construction for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.
 - (2) Mortar: Properties will be tested per ASTM C 780.
 - (3) Grout: Sampled and tested for compressive strength per ASTM C 1019.
 - (4) Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

i) CLEANING

- i) Clean unit masonry by dry brushing to remove mortar fins and smears before tooling joints, as work progresses.
- ii) After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - (1) Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 - (2) Protect adjacent surfaces from contact with cleaner.
 - (3) Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

END OF SECTION 048100

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Miscellaneous steel framing and supports.
 - 2. Shelf angles.
 - 3. Loose bearing and leveling plates.
 - 4. Steel weld plates and angles.
 - 5. Miscellaneous steel trim.
 - 6. Metal bollards.
 - 7. Loose steel lintels.
- B. See Division 05 Section "Pipe and Tube Railings" for metal pipe and tube railings.

1.2 SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
- B. Templates: For anchors and bolts.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
 - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.
- B. Ferrous Metals:
 - 1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - 2. Steel Tubing: ASTM A 500, cold-formed steel tubing.
 - 3. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.3 FASTENERS

- A. General: Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.
- B. Cast-in-Place Anchors in Concrete: Threaded or wedge type; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI #79.
- B. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for regalvanizing welds in steel.
- C. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.
- D. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa), unless otherwise indicated.

2.5 FABRICATION

- A. General: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
 - 1. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
 - 2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
 - 3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
 - 4. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
 - 5. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, not less than 24 inches (600 mm) o.c.
- B. Miscellaneous Framing and Supports: Provide steel framing and supports not specified in other Sections as needed to complete the Work. Fabricate units from steel shapes, plates, and bars of welded construction. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- C. Loose Steel Lintels: Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
 - 1. Lintels in Exterior Walls: Galvanize.
- D. Shelf Angles: Fabricate shelf angles of sizes indicated and for attachment to framing. Fabricate with horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c.
 - 1. Shelf Angles in Exterior Walls: Galvanize.

2. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.
- E. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts.
- F. Miscellaneous Steel Trim: Fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
 1. Exterior Miscellaneous Steel Trim: Galvanize.
- G. Metal Bollards: Fabricate from Schedule 40 steel pipe.

2.6 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Finish metal fabrications after assembly.
- B. Steel and Iron Finishes:
 1. Hot-dip galvanize items as indicated to comply with ASTM A 123/A 123M or ASTM A 153/A 153M as applicable.
 2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with requirements indicated below for environmental exposure conditions of installed metal fabrications:
 - a. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
 1. Fit exposed connections accurately together. Weld connections that are not to be left as exposed joints but cannot be shop welded. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
 2. Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction.
 3. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- B. Set bearing and leveling plates on cleaned surfaces using wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts and pack solidly with nonshrink, nonmetallic grout.
- C. Bollards:

1. Anchor bollards in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace bollards in position until concrete has cured.
 2. Fill bollards solidly with concrete, mounding top surface to shed water.
- D. Touch up surfaces and finishes after erection.
1. Painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with the same material as used for shop painting.
 2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Framing with dimension lumber.
 - 2. Framing with engineered wood products.
 - 3. Wood blocking and nailers.
 - 4. Wood furring.
 - 5. Plywood backing panels.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
- B. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:
 - 1. Wood-preservative-treated wood.
 - 2. Engineered wood products.
 - 3. Power-driven fasteners.
 - 4. Powder-actuated fasteners.
 - 5. Expansion anchors.
 - 6. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
 - 1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWPAC2.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood sills, sleepers, blocking, and similar concealed members in contact with masonry or concrete.
 - 2. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Maximum Moisture Content: 19 percent.
- B. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade of any species.
- C. Framing Other Than Non-Load-Bearing Interior Partitions: No. 2 grade and any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Southern pine; SPIB.
 - 3. Douglas fir-larch; WCLIB or WWPAC.
 - 4. Spruce-pine-fir; NLGA.
 - 5. Hem-fir; WCLIB or WWPAC.
- D. Framing Other Than Non-Load-Bearing Interior Partitions: Any species and grade with a modulus of elasticity of at least **1,500,000 psi (10 350 MPa)** and an extreme fiber stress in bending of at least **1000 psi (6.9 MPa)** [**850 psi (5.86 MPa)** for **2-inch nominal (38-mm actual)** thickness and **12-inch nominal (286-mm actual)** width for single-member use.

2.4 ENGINEERED WOOD PRODUCTS

- A. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
 - 1. Extreme Fiber Stress in Bending, Edgewise: **3100 psi (21.3 MPa)** for **12-inch nominal- (286-mm actual-)** depth members.
 - 2. Modulus of Elasticity, Edgewise: **2,000,000 psi (13 700 MPa)**.
- B. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D 5055.
 - 1. Provide I-joists manufactured without urea formaldehyde.
 - 2. Web Material: Either oriented strand board or plywood, complying with DOC PS 1 or DOC PS 2, Exposure 1.
 - 3. Structural Properties: Provide units with depths and design values not less than those indicated.
 - 4. Provide units complying with APA PRI-400, factory marked with APA trademark indicating nominal joist depth, joist class, span ratings, mill identification, and compliance with APA standard.

- C. Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation report for I-joists.
 - 1. Material: All-veneer product glued-laminated wood or [product made from any combination solid lumber, wood strands, and veneers]. Provide rim boards made without urea formaldehyde.
 - 2. Thickness: **1 inch (25 mm)** [**1-1/8 inches (28 mm)**].
 - 3. Provide performance-rated product complying with APA PRR-401, **[rim board] [rim board plus]** grade, factory marked with APA trademark indicating thickness, grade, and compliance with APA standard.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Furring.
- B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 19 percent maximum moisture content of any species.
- C. For concealed boards, provide lumber with 15 percent maximum moisture content and the following species and grades:
 - 1. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

2.6 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged in thickness indicated or, if not indicated, not less than **1/2-inch (13-mm)** nominal thickness.

2.7 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: NES NER-272.
- C. Bolts: Steel bolts complying with **ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6)**; with **ASTM A 563 (ASTM A 563M)** hex nuts and, where indicated, flat washers.

2.8 METAL FRAMING ANCHORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Products: Subject to compliance with requirements, provide or comparable products by one of the following:

1. Alpine Engineered Products, Inc.
2. Cleveland Steel Specialty Co.
3. Harlen Metal Products, Inc.
4. KC Metals Products, Inc.
5. Simpson Strong-Tie Co., Inc.
6. Southeastern Metals Manufacturing Co., Inc.
7. USP Structural Connectors.

- D. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated.
- E. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, **G60 (Z180)** coating designation.

2.9 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; **1-inch (25-mm)** nominal thickness, compressible to **1/32 inch (0.8 mm)**; selected from manufacturer's standard widths to suit width of sill members indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.
- D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.
- E. Do not splice structural members between supports, unless otherwise indicated.
- F. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
- G. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Roof sheathing.
 - 2. Building wrap.
 - 3. Flexible flashing at openings in sheathing.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

- A. Plywood: DOC PS 1.
- B. Oriented Strand Board: DOC PS 2.

2.2 ROOF SHEATHING

- A. Plywood Roof Sheathing: Exterior, Structural I sheathing.
- B. Oriented-Strand-Board Roof Sheathing: Exposure 1, Structural I sheathing.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated.
 - 1. For roof sheathing panels, provide fasteners with corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

2.4 WEATHER-RESISTANT SHEATHING PAPER

- A. Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
 - b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
 - c. Ludlow Coated Products; Air Stop Housewrap.
 - d. Pactiv, Inc.; GreenGuard Classic Wrap.
 - e. Raven Industries Inc.; Rufco-Wrap.
 - f. Reemay, Inc.; Tytar HouseWrap.
2. Water-Vapor Permeance: Not less than 152 g through 1 sq. m of surface in 24 hours per ASTM E 96, Desiccant Method (Procedure A).

B. Building-Wrap Tape: Tape recommended by building-wrap manufacturer.

2.5 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use indicated by manufacturers of both adhesives and panels.
 1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D.
- B. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than **0.025 inch (0.6 mm)**.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Securely attach to substrate by fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- B. Coordinate sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that exclude exterior moisture.
- C. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial."
 1. Comply with "Code Plus" installation provisions in guide referenced in paragraph above.
- B. Fastening Methods: Fasten panels as indicated below:
 1. Roof Sheathing:
 - a. Nail or staple to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.

3.3 WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

- A. General: Cover sheathing with weather-resistant sheathing paper as follows:
 - 1. Cut back barrier **1/2 inch (13 mm)** on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum **4-inch (100-mm)** overlap, unless otherwise indicated.
- B. Building Wrap: Comply with manufacturer's written instructions.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

3.4 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturers written instructions.
 - 1. Lap seams and junctures with other materials at least **4 inches (100 mm)**, except that at flashing flanges of other construction, laps need not exceed flange width.
 - 2. Lap flashing over weather-resistant building paper at bottom and sides of openings.
 - 3. Lap weather-resistant building paper over flashing at heads of openings.
 - 4. After flashing has been applied, roll surfaces with a hard rubber or metal roller.

3.5 PROTECTION

- A. Paper-Surfaced Gypsum Sheathing: Protect sheathing by covering exposed exterior surface of sheathing with weather-resistant sheathing paper securely fastened to framing. Apply covering immediately after sheathing is installed.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Wood roof trusses.
2. Metal truss accessories.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads indicated. Comply with requirements in TPI 1.

1.3 SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Show fabrication and installation details for trusses.

1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2. Indicate sizes, stress grades, and species of lumber.
3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
5. Show splice details and bearing details.
6. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Comply with applicable requirements and recommendations of the following publications:

1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."

2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
 3. TPI HIB, "Commentary and Recommendations for Handling, Installing & Bracing Metal Plate Connected Wood Trusses."
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

- A. Lumber: DOC PS 20. Provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.
- B. Grade and Species: For truss chord and web members, provide dimension lumber of any species, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values according to AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."
- C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 06 Section Rough Carpentry.

2.2 METAL PRODUCTS

- A. Connector Plates: Fabricate connector plates to comply with TPI 1 from hot-dip galvanized steel sheet complying with ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); **G60 (Z180)** coating designation; and not less than **0.036 inch (0.9 mm)** thick.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpine Engineered Products, Inc.
 - b. Cherokee Metal Products, Inc.; Masengill Machinery Company.
 - c. CompuTrus, Inc.
 - d. Eagle Metal Products.
 - e. Jager Building Systems, Inc.
 - f. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.
 - g. Robbins Engineering, Inc.
 - h. TEE-LOK Corporation; a subsidiary of Berkshire Hathaway Inc.
 - i. Truswal Systems Corporation.
- B. Fasteners: Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
1. Nails, Brads, and Staples: ASTM F 1667.
 2. Power-Driven Fasteners: NES NER-272.
 3. Wood Screws: ASME B18.6.1.

4. Lag Bolts: **ASME B18.2.1** (**ASME B18.2.3.8M**).
 5. Bolts: Steel bolts complying with **ASTM A 307**, **Grade A** (**ASTM F 568M**, **Property Class 4.6**); with **ASTM A 563** (**ASTM A 563M**) hex nuts and, where indicated, flat washers.
- C. Metal Truss Accessories: Provide truss accessories made from hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, **G60 (Z180)** coating designation.
1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cleveland Steel Specialty Co.
 - b. Harlen Metal Products, Inc.
 - c. KC Metals Products, Inc.
 - d. Simpson Strong-Tie Co., Inc.
 - e. Southeastern Metals Manufacturing Co., Inc.
 - f. USP Structural Connectors.
 2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.3 FABRICATION

- A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in truss accessories according to manufacturer's fastening schedules and written instructions.
- F. Securely connect each truss ply required for forming built-up girder trusses.

- G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install bracing to comply with Division 06 Section Rough Carpentry. Retain subparagraph below if floor trusses are required.
 - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- H. Install wood trusses within installation tolerances in TPI 1.
- I. Do not cut or remove truss members.
- J. Replace wood trusses that are damaged or do not meet requirements.

END OF SECTION 061753

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Interior standing and running trim.
 - 2. Shower benches.
- B. See Division 06 Section "Interior Architectural Woodwork" for interior woodwork not specified in this Section.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.
- B. Samples: For each type of paneling indicated.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.

2.2 STANDING AND RUNNING TRIM

- A. Softwood Lumber Trim:
 - 1. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine; C Select (Choice) ; NeLMA, NLGA, or WWPA.
 - 2. Maximum Moisture Content: 19 percent.
- B. Hardwood Lumber:
 - 1. Species and Grade: Clear maple; NHLA.
 - 2. Maximum Moisture Content: 9 percent.
 - 3. Factory finished with 3-coats clear waterproof urethane finish.
- C. Opaque Finish (Painted): Made to patterns included in WMMPA WM 12.
 - 1. Softwood Moldings: WMMPA WM 4, P-grade.
 - a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
 - b. Maximum Moisture Content: 15 percent.
- D. Molding Patterns:

1. Base Pattern: WM 623, 9/16-by-3-1/4-inch (14-by-83-mm) ogee base.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.2 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 1. Scribe and cut interior finish carpentry to fit adjoining work.
 2. Countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.
 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset.

3.3 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Cope at returns and miter at corners to produce tight-fitting joints. Use scarf joints for end-to-end joints.

3.4 BENCH INSTALLATION

- A. Railings: Secure wall rails with metal brackets. Fasten to supports with carriage bolts on washers..

END OF SECTION 062023

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate cabinets.
- B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

- A. Product Data: For cabinet hardware and accessories and finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
 - 1. Plastic-laminates, for each type, color, pattern, and surface finish.
 - 2. Thermoset decorative panels, for each type, color, pattern, and surface finish.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of woodwork.
- B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards."

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

- A. Fabricators: Subject to compliance with requirements, provide interior architectural woodwork by one of the following:

2.2 MATERIALS

- A. Wood Products:
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.

- B. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

2.3 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.4 FABRICATION

- A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
 - 1. Interior Woodwork Grade: Custom.
- B. Plastic-Laminate Cabinets:
 - 1. WI Construction Type: Type I, multiple self-supporting units rigidly joined together.
 - 2. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:
 - a. Horizontal Surfaces Other Than Tops: Grade HGS.
 - b. Vertical Surfaces: Grade HGS.
 - c. Edges: Grade HGS PVC T-mold matching laminate in color, pattern, and finish.
 - 3. Colors, Patterns, and Finishes: Almond.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.
- B. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm). Shim as required with concealed shims.
- C. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- E. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Scarf running joints and stagger in adjacent and related members. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.

END OF SECTION 064023

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Cold-applied, emulsified-asphalt dampproofing.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 PROJECT CONDITIONS

- A. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. ChemMasters Corp.
 - 2. Degussa Building Systems; Sonneborn Brand Products.
 - 3. Gardner Gibson, Inc.
 - 4. Henry Company.
 - 5. Karnak Corporation.
 - 6. Koppers Inc.
 - 7. Malarkey Roofing Products.
 - 8. Meadows, W. R., Inc.
 - 9. Tamms Industries, Inc.
- B. Trowel Coats: ASTM D 1227, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
- E. VOC Content: Zero.

2.2 PROTECTION COURSE

- A. Protection Course, Asphalt-Board Type: ASTM D 6506, premolded, 1/8-inch- (3-mm-) thick, multiply, semirigid board consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, and faced on 1 side with polyethylene film.

2.3 MISCELLANEOUS MATERIALS

- A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.2 APPLICATION, GENERAL

- A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.
- B. Apply dampproofing to footings and foundation walls where opposite side of wall faces **[building interior] [occupied space]**.
 - 1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of **6 inches (150 mm)** over outside face of footing.
 - 2. Extend **12 inches (300 mm)** onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an **8-inch- (200-mm-)** wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Apply dampproofing to provide continuous plane of protection on interior face of above-grade, exterior concrete walls unless walls are indicated to receive direct application of paint.

3.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. On Concrete Foundations[**and Parged Masonry Foundation Walls**]: Apply 2 brush or spray coats at not less than **1.5 gal./100 sq. ft. (0.6 L/sq. m)** for first coat and **1 gal./100 sq. ft. (0.4 L/sq. m)** for second coat, 1 fibered brush or spray coat at not less than **3 gal./100 sq. ft. (1.2 L/sq. m)**, or 1 trowel coat at not less than **4 gal./100 sq. ft. (1.6 L/sq. m)**.

3.4 INSTALLATION OF PROTECTION COURSE

- A. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material manufacturer's written recommendations for attaching protection course.
 - 1. Support protection course with spot application of adhesive of type recommended by protection board manufacturer over cured coating.
 - 2. Install protection course **[on same day] [within 24 hours]** of installation of dampproofing (while coating is tacky) to ensure adhesion.

END OF SECTION 071113

SECTION 074113 - METAL ROOF PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concealed-fastener, lap-seam metal roof and fascia panels.
2. Metal soffit panels.
3. Gutters and downspouts.

B. Related Sections:

1. Division 07 Section "Sheet Metal Roofing" for custom-fabricated and on-site, roll-formed sheet metal roofing.

1.2 PERFORMANCE REQUIREMENTS

A. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

B. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

C. FMG Listing: Provide metal roof panels and component materials that comply with requirements in FMG 4471 as part of a panel roofing system and that are listed in FMG's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FMG markings.

1. Fire/Windstorm Classification: Class 1A-60.
2. Hail Resistance: MH.

D. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of **20 lbf/sq. ft. (957 Pa)**, acting inward or outward.
2. Snow Loads: **30 lbf/sq. ft. (1436 Pa)**.
3. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than 1/240 of the span.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

- C. Samples: For each type of exposed finish required.
- D. Maintenance data.
- E. Warranties: Samples of special warranties.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, **G90 (Z275)** coating designation; structural quality.
 - 2. Surface: Smooth, flat finish.
 - 3. Exposed Coil-Coated Finish:
 - a. 3-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.
 - 4. Concealed Finish: Manufacturer's standard white or light-colored acrylic or polyester backer finish.
- B. Panel Sealants:
 - 1. Joint Sealant: ASTM C 920; as recommended in writing by metal roof panel manufacturer.

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: **30 to 40 mils (0.76 to 1.0 mm)** thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at **240 deg F (116 deg C)**; ASTM D 1970.

2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
 - b. Grace Construction Products; a unit of Grace, W. R. & Co.; Ultra.
 - c. Henry Company; Blueskin PE200 HT.
 - d. Metal-Fab Manufacturing, LLC; MetShield.
 - e. Owens Corning; WeatherLock Metal High Temperature Underlayment.

B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.3 MISCELLANEOUS MATERIALS

- A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.4 CONCEALED-FASTENER, LAP-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AEP-Span.
 - b. Alcoa Inc.
 - c. Berridge Manufacturing Company.
 - d. Cheney Flashing Company.
 - e. Copper Sales, Inc.
 - f. Dimensional Metals, Inc.
 - g. Englert, Inc.
 - h. McElroy Metal, Inc.
 - i. Merchant & Evans.
 - j. Metal Fab Manufacturing.
 - k. Metal Sales Manufacturing Corporation.
2. Profile: Tapered rib as indicated on Drawings.
3. Material: Zinc-coated (galvanized) steel sheet, 0.022-inch (0.56-mm) nominal thickness.
4. Panel Coverage: 12 - inches.
5. Panel Height: 1 ½ inches.

2.5 METAL SOFFIT PANELS

- A. General: Provide factory-formed perforated metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.
- B. Metal Soffit Panels: Match profile and material of metal roof panels.

1. Finish: Match finish and color of metal roof panels.
2. Sealant: Factory applied within interlocking joint.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AEP-Span.
 - b. Architectural Building Components.
 - c. ATAS International, Inc.
 - d. Berridge Manufacturing Company.
 - e. CENTRIA Architectural Systems.
 - f. Cheney Flashing Company.
 - g. Copper Sales, Inc.
 - h. Dimensional Metals, Inc.
 - i. Englert, Inc.
 - j. Fabral.
 - k. IMETCO.
 - l. MBCI; a division of NCI Building Systems, L. P.
 - m. McElroy Metal, Inc.
 - n. Merchant & Evans.
 - o. Metal-Fab Manufacturing, LLC.
 - p. Metal Sales Manufacturing Corporation.
 - q. Petersen Aluminum Corporation.
 - r. Ultra Seam Incorporated.
4. Profile: V groove.
5. Panel Coverage: **8 inches (203 mm)**.
6. Panel Height: **0.875 inch (22 mm)**.
7. Sealant: Factory applied within interlocking joint.

2.6 ACCESSORIES

- A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.
 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum **1-inch- (25-mm-)** thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
 3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
- B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum **0.018 inch (0.45 mm)** thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.
- C. Gutters: Formed from same material roof panels. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum **96-inch- (2400-mm-)** long sections, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced a maximum of **36 inches (900 mm)** o.c., fabricated from same metal as gutters. Provide wire ball strainers of compatible metal at outlets. Finish gutters to match metal roof panels.

- D. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot- (3-m-) long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match gutters.

2.7 FABRICATION

- A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
- B. Felt Underlayment: Apply at locations indicated on Drawings, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).
- C. Apply slip sheet over underlayment before installing metal roof panels.

3.3 METAL ROOF PANEL INSTALLATION

- A. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
 - 1. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 - 2. Lap ribbed or fluted sheets one full rib corrugation.
 - 3. Provide metal-backed neoprene or EPDM washers under heads of exposed fasteners bearing on weather side of metal roof panels.

4. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
 5. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 6. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
 7. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps, and on side laps of nesting-type panels; on side laps of corrugated nesting-type, ribbed, or fluted panels; and elsewhere as needed to make panels weatherproof to driving rains.
 8. At panel end splices, nest panels with minimum **6-inch (150-mm)** end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.
- B. Metal Soffit Panels: Provide metal soffit panels full width of soffits. Install panels perpendicular to support framing.
1. Flash and seal panels with weather closures where metal soffit panels meet walls and at perimeter of all openings.

3.4 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
 2. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 3. Provide elbows at base of downspouts to direct water away from building.

3.5 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.

1.2 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples: For each kind and color of joint sealant required.
- C. Product test reports.
- D. Warranties.

1.3 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 1. Architectural Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- B. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.2 SILICONE JOINT SEALANTS

- A. Mildew-Resistant Neutral-Curing Acid-Curing Silicone Joint Sealant: ASTM C 920.
 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. BASF Building Systems.
 - b. Dow Corning Corporation.
 - c. GE Advanced Materials - Silicones.
 - d. May National Associates, Inc.
 - e. Pecora Corporation.
 - f. Polymeric Systems, Inc.
 - g. Schnee-Morehead, Inc.
 - h. Sika Corporation; Construction Products Division.
 - i. Tremco Incorporated.
- 2. Type: Single component (S).
 - 3. Grade: nonsag (NS).
 - 4. Class: 100/50.
 - 5. Uses Related to Exposure: Traffic (T).

2.3 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Building Systems.
 - b. Bostik, Inc.
 - c. May National Associates, Inc.
 - d. Pecora Corporation.
 - e. Schnee-Morehead, Inc.
 - f. Tremco Incorporated.

2.4 JOINT SEALANT BACKING

- A. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.5 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove laitance and form-release agents from concrete.
 - 2. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- B. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

- F. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.3 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in vertical surfaces.

- 1. Joint Locations:

- a. Construction joints in cast-in-place concrete.
- b. Control and expansion joints in unit masonry.
- c. Joints in dimension stone cladding.
- d. Joints between metal panels.
- e. Joints between different materials listed above.
- f. Perimeter joints between materials listed above and frames of doors, windows and louvers.
- g. Control and expansion joints in ceilings and other overhead surfaces.
- h. Other joints as indicated.

- 2. Joint Sealant: Silicone.

- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

- B. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

- 1. Joint Locations:

- a. Control and expansion joints on exposed interior surfaces of exterior walls.
- b. Perimeter joints of exterior openings where indicated.
- c. Vertical joints on exposed surfaces of interior unit masonry, concrete, walls and partitions.
- d. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.
- e. Other joints as indicated.

- 2. Joint Sealant: Latex.

- C. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

- 1. Joint Sealant Location:

- a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
- b. Tile control and expansion joints where indicated.

- 2. Joint Sealant: Silicone.

- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal doors and frames.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required.
- E. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Amweld Building Products, LLC.
 - 2. Benchmark; a division of Therma-Tru Corporation.
 - 3. Ceco Door Products; an Assa Abloy Group company.
 - 4. Curries Company; an Assa Abloy Group company.
 - 5. Deansteel Manufacturing Company, Inc.
 - 6. Firedoor Corporation.
 - 7. Fleming Door Products Ltd.; an Assa Abloy Group company.
 - 8. Habersham Metal Products Company.
 - 9. Kewanee Corporation (The).
 - 10. Mesker Door Inc.
 - 11. Pioneer Industries, Inc.
 - 12. Security Metal Products Corp.
 - 13. Steelcraft; an Ingersoll-Rand company.
 - 14. Windsor Republic Doors.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, CS, Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B.

- C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- E. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.
- F. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Comply with ANSI/SDI A250.8.
 - 1. Design: Flush panel.
 - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.
 - 3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
 - 4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
 - 5. Tolerances: SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."
- B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Comply with ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 - 1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 1 (Full Flush).
- C. Hardware Reinforcement: ANSI/SDI A250.6.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8.
- B. Exterior Frames: Fabricated from metallic-coated steel sheet.
 - 1. Fabricate frames with mitered or coped corners.
 - 2. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
- C. Hardware Reinforcement: ANSI/SDI A250.6.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
- B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 STOPS AND MOLDINGS

- A. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, same material as frames.

2.7 FABRICATION

- A. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.
- B. Hollow Metal Doors:
 1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors. Seal joints in top edges of doors against water penetration.
- C. Hollow Metal Frames: Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
 - 1) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
 5. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers.
 - a. Single-Door Frames: Three door silencers.
- D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 electrical Sections.
- E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 1. Provide fixed stops and moldings welded on secure side of hollow metal work.

2.8 STEEL FINISHES

- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: ANSI/SDI A250.10.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hollow Metal Frames: Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-protection-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable glazing stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

B. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:
 - a. Jambs and Head: **1/8 inch (3 mm)** plus or minus **1/16 inch (1.6 mm)**.
 - b. Between Edges of Pairs of Doors: **1/8 inch (3 mm)** plus or minus **1/16 inch (1.6 mm)**.
 - c. Between Bottom of Door and Top of Threshold: Maximum **3/8 inch (9.5 mm)**.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum **3/4 inch (19 mm)**.

3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

SECTION 081113

SECTION 085113 - ALUMINUM WINDOWS

1.1 GENERAL

- A. This Section includes fixed and operable commercial grade aluminum-framed windows of the performance class indicated.
- B. Performance Requirements: Provide windows engineered, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading without failure, as demonstrated by testing manufacturer's standard window assemblies representing types, grades, classes, and sizes required for Project according to test methods indicated.
- C. Testing shall demonstrate compliance with requirements indicated in AAMA 101 for air infiltration, water penetration, and structural performance for type, grade, and performance class of windows required. Where required design pressure exceeds the minimum for the specified window grade, comply with AAMA 101, Section 3, "Optional Performance Classes."
- D. Test Criteria: Testing shall be performed by a qualified independent testing agency based on the following criteria:
 - 1. Design wind velocity at Project site is 70 mi./h (113 km/h).
 - 2. Heights of window units above grade at window centerline are indicated on or can be determined from the Drawings. Consult with the Architect, if necessary, to confirm required loading and test pressures.
 - 3. Test Procedures: Test window units according to ASTM E 283 for air infiltration, ASTM E 547 for water penetration, and ASTM E 330 for structural performance.
- E. Submittals: Submit the following:
 - 1. Product Data for each type of window required, including construction details and fabrication methods; profiles and dimensions of individual components; data on hardware, accessories, and finishes. Include recommendations for maintaining and cleaning exterior surfaces.
 - 2. Shop Drawings showing fabrication and installation of each type of window required. Include layout and installation details, elevations at 1/4 inch = 1 foot (1:50) scale, typical window unit elevations at 3/4 inch = 1 foot (1:20) scale, and full-size section details of typical composite members.
 - 3. Samples for initial color selection on 12-inch- (300-mm-) long sections of window members. Where finishes involve normal color variations, include Sample sets showing the full range of variations expected.
 - 4. Test reports from a qualified independent testing agency indicating that each type, grade, and size of window unit complies with performance requirements indicated. Test results based on use of down-sized test units will not be accepted.

1.2 PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Capitol Products Corp.
 - 2. EFCO Corporation.
 - 3. Kawneer Corporation.
 - 4. Peerless Products, Inc.
 - 5. TRACO.
 - 6. Wausau Metals Corporation.
 - 7. Winco Manufacturing Co.
- B. Window Type: Hopper as indicated on drawings.
- C. Aluminum Extrusions: Alloy and temper recommended for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi (150-MPa) ultimate tensile strength and

not less than 0.062 inch (1.6 mm) thick at any location for main frame and sash members.

- D. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted to be noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
 - 1. Where fasteners screw anchor into aluminum less than 0.125 inch (3.2 mm) thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads or provide standard, noncorrosive, pressed-in, splined grommet nuts.
 - 2. Except for application of hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- E. Anchors, Clips, and Window Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel complying with ASTM B 633 and of sufficient strength to withstand design pressure indicated.
- F. Hardware: Aluminum, stainless steel, or other corrosion-resistant material compatible with aluminum and of sufficient strength to perform the function for which it is intended.
- G. Accessories: Manufacturer's standard accessories that comply with indicated standards.
- H. Fabrication: Window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units. Provide units that are reglazable without dismantling sash or ventilator framing.
- I. Thermally Improved Construction: Fabricate window units with an integral, concealed, low-conductance, thermal barrier, between exterior materials and window members exposed on interior, in a manner that eliminates direct metal-to-metal contact.
 - 1. Weep holes and internal passages to conduct infiltrating water to exterior.
 - 2. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.
 - 3. Glazing Stops: Screw-applied or snap-on glazing stops. Finish to match windows.
- J. Preglazed Fabrication: Preglaze window units where possible and practical. Comply with glass and glazing requirements of Division 8 Section "Glazing" of these Specifications and AAMA 101.
- K. Finishes: Comply with NAAMM "Metal Finishes Manual." Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.
- L. Class I, Clear Anodic Finish: AA-M12C22A41.

1.3 EXECUTION

- A. Inspection: Inspect openings before installation. Verify that rough opening is correct and sill plate is level.
- B. Installation: Comply with manufacturer's recommendations for installing window units, hardware, operators, and other components. Set windows plumb, level, and true to line, without warp or rack of frames or sash. Anchor securely in place.
 - 1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action.
- C. Set sill members and other members in a bed of sealant or with joint fillers or gaskets to provide weathertight construction. Coordinate installation with wall flashings and other components of the Work.
- D. Field Quality Control: Conduct on-site tests with window manufacturer's representative present.

The Architect will select units to be tested. Testing shall be performed by a qualified independent testing agency selected by the Architect.

1. Air-Infiltration Tests: Conduct according to requirements of ASTM E 783. Allowable infiltration shall not exceed 1.5 times the amount indicated.
 2. Water-Resistance Tests: Conduct according to requirements of ASTM E 1105. No water leakage is permitted.
 3. Window units not meeting specified requirements and units having similar deficiencies shall be corrected at no cost to the Owner.
- E. Clean aluminum promptly after installing windows. Avoid damage to finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts.
- F. Clean glass of preglazed units promptly after installing windows.
- G. Protect installed aluminum windows to ensure that they are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 085113

SECTION 086201 - TUBULAR SKYLIGHTS AND VENTILATORS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Self-flashing tubular skylights system.
 - 2. Gravity type, roof mounted ventilators.

1.2 SUBMITTALS

- A. Product Data: For each type of skylight indicated.
- B. Shop Drawings: For skylight work. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating skylights that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to unit skylight and ventilator manufacturer for installation of units required for this Project.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Solar tube or approved equal, 14-inch diameter for metal roofing installation.
 - 1. APC Dayliter; C/S Group.
 - 2. Solar Industries, Inc.
 - 3. VELUX America.
 - 4. Or approved equal.

- C. Heavy duty, vandal resistant, aluminum, minimum 250 cfm, gravity type, roof mounted attic ventilator units. Factory colored to match roofing color. Provide factory manufactured flashing for ventilator matching metal roofing system manufacturer requirements and color.
 - 1. Broan Industries
 - 2. Or approved equal.

2.2 MATERIALS

- A. Aluminum Components:
 - 1. Sheets: **ASTM B 209** (**ASTM B 209M**), alloy and temper to suit forming operations and finish requirements but with not less than the strength and durability of alclad Alloy 3005-H25.
- B. Fasteners: Same metal as metal being fastened, nonmagnetic stainless steel, or other noncorrosive metal as recommended by manufacturer. Finish exposed fasteners to match material being fastened.

2.3 GLAZING

- A. Acrylic Glazing: ASTM D 4802, thermoformable, monolithic sheet, category as standard with manufacturer, Finish 1 (smooth or polished), manufacturer's standard.

2.4 INSTALLATION MATERIALS

- A. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic, nominally free of sulfur and containing no asbestos fibers, formulated for **15-mil** (**0.4-mm**) dry film thickness per coating.
- B. Joint Sealants: As specified in Division 07 Section "Joint Sealants."
- C. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- D. Roofing Cement: ASTM D 4586, asbestos free, designed for trowel application or other adhesive compatible with roofing system.
- E. Factory manufactured flashing for metal roofing installation

2.5 UNIT SKYLIGHTS

- A. General: Provide factory-assembled unit skylights that include glazing, extruded-aluminum glazing retainers, gaskets, and inner frames and that are capable of withstanding performance requirements indicated.
- B. Integral Curb: Manufacturer's standard aluminum, self-flashing type.
- C. Unit Shape and Size: Minimum 14-inch diameter, round.

PART 3 - EXECUTION

3.1 ATTIC VENTILATOR UNITS

- A. General: Provide factory-assembled attic ventilator units that include all components for gravity operation and that are capable of withstanding performance requirements indicated.

- B. Integral Curb: Manufacturer's standard aluminum, self-flashing type.
- C. 16 to 18-inches round or square.

3.2 INSTALLATION

- A. Coordinate installation of skylights and ventilators with installation of substrates, vapor retarders, roof insulation, roofing membrane, and flashing as required to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight.

3.3 CLEANING

- A. Clean exposed unit skylight surfaces according to manufacturer's written instructions.

END OF SECTION 086200

SECTION 087100 - DOOR HARDWARE

1.1 GENERAL

- A. Submittals: In addition to Product Data for each item specified, submit the following:
 - 1. Shop Drawings: Details of electrified door hardware, including wiring diagrams.
 - 2. Samples: For each type of exposed finish.
 - 3. Door Hardware Schedule: Organize into door hardware sets indicating type, style, function, size, label, hand, manufacturer, fasteners, location, and finish of each door hardware item. Include description of each electrified door hardware function, including sequence of operation.
 - 4. Keying Schedule: Detail Owner's final keying instructions for locks.
 - 5. Product Certificates: Certifying that door hardware complies with listed fire door assemblies.
- B. Supplier Qualifications: Door hardware supplier who is or employs a qualified DHI Architectural Hardware Consultant.
- C. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying schedule.
- D. Deliver keys to [manufacturer of key control system] [Owner by registered mail].
- E. Templates: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware.

1.2 PRODUCTS

- A. Scheduled Door Hardware: Provide door hardware for each door to comply with requirements in this Section, and the Door Hardware Schedule.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.
 - 2. Designations: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- B. Standards: Comply with BHMA A156 series standards, Grade 1.
- C. Certified Products: Provide door hardware that is listed in one of BHMA's directories of certified products.
- D. Hinges and Pivots: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
 - 1. Hinge Base Metal: Unless otherwise indicated, provide the following:
 - a. Interior Hinges: Stainless steel, with stainless-steel pin.
 - b. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.
 - 2. Nonremovable Pins: Provide set screw in hinge barrel that prevents removal of pin while door is closed.
 - 3. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
 - 4. Wood Screws: For wood doors and frames.
 - 5. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
- E. Locks and Latches: As follows:
 - 1. Provide the lockset design designated below or, if sets are provided by another manufacturer,

provide designs that match those designated:

- a. Bored Locks: As designated in Hardware Schedule.
 2. Dummy Trim: Match lock trim and escutcheons.
 3. Lock Throw: Comply with labeled fire door requirements.
 4. Backset: 2-3/4 inches (70 mm), unless otherwise indicated.
- F. Bolts: Comply with labeled fire door requirements.
- G. Surface Bolts: Flush bolt heads of minimum 1/2-inch- (12.7-mm-) diameter rods of brass, bronze, or stainless steel with minimum 12-inch- (305-mm-) long rod.
- H. Fire Exit Devices Corridor Doors: Complying with NFPA 80 that are listed and labeled for fire and panic protection, based on testing according to UL 305 and NFPA 252.
1. Outside Trim: Pull with cylinder; material, finish, and design to match locksets and latchsets, unless otherwise indicated.
- I. Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
1. Number of Pins: Seven.
 2. High-Security Grade: BHMA Grade 1A, listed and labeled as complying with UL 437 (Suffix A).
 3. Permanent Cores: Manufacturer's standard; finish face to match lockset; interchangeable cores.
 4. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
 - a. Replace construction cores with permanent cores, as directed by Owner.
 - b. Furnish permanent cores to Owner for installation.
- J. Keying System: Factory-registered keying system; match the existing grand master key system.
1. Keys: Provide nickel-silver keys permanently inscribed with a visual key control number and "DO NOT DUPLICATE" notation. In addition to one extra blank key for each lock, provide three change keys and five grand master keys.
- K. Strikes: Manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set.
- L. Closers: Comply with the following:
1. Flush Floor Plates: Finish cover plates for floor closers unless thresholds are indicated. Match door hardware finish.
 2. Recessed Floor Plates: Provide insert of floor finish material for floor closers, unless thresholds are indicated. Provide extended closer spindle to accommodate thickness of floor finish.
 3. Size of Units: Factory sized, adjustable to meet field conditions and requirements for opening force.
- M. Protective Trim Units: Furnish protection plates sized 1-1/2 inches (38 mm) less than door width on push side and 1/2 inch (13 mm) less than door width on pull side, by height specified in Door Hardware Schedule. Fasten with exposed machine or self-tapping screws.
- N. Floor Stops: For doors, unless wall or other type stops are indicated. Do not mount floor stops where they will impede traffic.
- O. Silencers for Door Frames: Neoprene or rubber; fabricated for drilled-in application to frame.

- P. Door Gasketing: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
1. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled, based on testing according to UL 1784.
 2. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled, based on testing according to UL 10B or NFPA 252.
 3. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.
- Q. Fabrication: As follows:
1. Base Metals: Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18 for finishes. Do not furnish manufacturer's standard materials if different from specified standard.
 2. Fasteners: Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated. Provide steel machine or wood screws or steel through bolts for fire-rated applications.
 3. Spacers or Sex Bolts: For through bolting of hollow metal doors.
 4. Fasteners for Wood Doors: Comply with requirements of DHI WDHS.2, "Recommended Fasteners for Wood Doors."

1.3 EXECUTION

- A. Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- B. Steel Door and Frame Preparation: Comply with DHI A115 series. Drill and tap doors and frames for surface-applied hardware according to SDI 107.
- C. Wood Door Preparation: Comply with DHI A115-W series.
- D. Mounting Heights: Comply with DHI requirements, unless otherwise indicated.
- E. Installation: Comply with manufacturer's written instructions. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
1. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Adjust and check each operating item of door hardware and each door to ensure proper operation or function. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with accessibility requirements. Clean operating items as necessary to restore proper function and finish.

G. Door Hardware Schedule:

Group 1

Doors 02,03,04,05,07,08,09,10

3 ea. Hinges	BB1191 4 ½ x 4 ½ NRP	US32D	Hager
1 ea. Deadlock	DL 4012	626	Corbin
1 ea. Deadlock, Occupied	D871	626	Falcon

1 ea. Push Plate	30 S 4 x 16	US32D	Hager
1 ea. Pull Plate	33 G 3 ½ x 15	US32D	Hager
1 ea. Closer	DC 8210 x A5 x M75	689	Corbin
1 ea. Threshold	172 A		Pemko
1 set W/Strip	309 AP		Pemko
1 ea. Door Sweep	3452 ANB		Pemko

Group 2
Doors 01, 11

3 ea. Hinges	BB1191 4 ½ x 4 ½ NRP	US32D	Hager
1 ea. Deadlock	DL 4012	626	Corbin
1 ea. Deadlock, Occupied	D891 BK	626	Falcon
1 ea. Push Plate	30 S 4 x 16	US32D	Hager
1 ea. Pull Plate	33 G 3 ½ x 15	US32D	Hager
1 ea. Closer	DC 8210 x A2 x M75	689	Corbin
1 ea. Wall Stop	232 W	US32D	Hager
1 ea. Threshold	272 A		Pemko
1 set W/Strip	309 AP		Pemko
1 ea. Door Sweep	3452 ANB		Pemko

Group 3
Door 08

3 ea. Hinges	BB1191 4 ½ x 4 ½ NRP	US32D	Hager
1 ea. Lockset	CL 3357 NZD	626	Corbin
1 ea. Closer	DC 8210 x A5 x M75	689	Corbin
1 ea. Threshold	171 A		Pemko
1 set W/Strip	309 AP		Pemko
1 ea. Door Sweep	3452 ANB		Pemko

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

- 1. Windows.

1.2 DEFINITIONS

- A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.
- B. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:
 - 1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: 90 mph.
 - b. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 - c. Thickness of Tinted and Heat-Absorbing Glass: Provide the same thickness for each tint color indicated throughout Project.
- C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

- D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites **6.0 mm thick**.
 2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite **6.0 mm thick** and a nominal **1/2-inch- (12.7-mm-)** wide interspace.
 3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as **Btu/ sq. ft. x h x deg F (W/sq. m x K)**.
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.

1.4 SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: **12-inch- (300-mm-)** square, for each type of glass product indicated, other than monolithic clear float glass.

1.5 QUALITY ASSURANCE

- A. Preconstruction Adhesion and Compatibility Testing: Submit to elastomeric glazing sealant manufacturers, for testing according to ASTM C 1087, samples of each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member that will contact or affect elastomeric glazing sealants:
- B. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: GANA's "Glazing Manual."
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR-A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Sloped Glazing Guidelines."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

1.6 WARRANTY

- A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 GLASS PRODUCTS

- A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated. All exterior windows.
 1. Ultra-Clear (Low-Iron) Float Glass: Class I (clear); with a minimum 91 percent visible light transmission and a minimum solar heat gain coefficient of 0.87.
 - a. Available Products:
 - 1) AFG Industries Inc.; Krystal Klear.
 - 2) Pilkington Building Products North America; Optiwhite.
 - 3) PPG Industries, Inc.; Starphire.
- B. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.
 1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
 2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
 3. Sealing System: Dual seal.
 4. Spacer Specifications: Manufacturer's standard spacer material and construction.
- C. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:
 1. Neoprene.
 2. EPDM.
 3. Silicone.
 4. Thermoplastic polyolefin rubber.
 5. Any material indicated above.

2.3 GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. VOC Content: For sealants used inside of the weatherproofing system, not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 4. Colors of Exposed Glazing Sealants:

- B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral- and Basic-Curing Silicone Glazing Sealants:

- a. Type and Grade: S (single component) and NS (nonsag).
- b. Class: 50.
- c. Use Related to Exposure: NT (nontraffic).
- d. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.

2.4 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.5 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.6 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

2.7 INSULATING-GLASS UNITS

- A. Passive Solar Low-E Insulating-Glass Units: All exterior windows.

1. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm.
2. Interspace Content: Argon.
3. Outdoor Lite: Class 1 (clear) float glass.
 - a. Annealed or Kind HS (heat strengthened).
 - b. Self-Cleaning, Low-Maintenance Coating: Pyrolytic coating on first surface.
4. Indoor Lite: Class 1 (clear) ultra-clear (low-iron) float glass.
 - a. Annealed Kind FT (fully tempered).
5. Low-E Coating: Pyrolytic on second surface.
6. Low-E-Coated Film: Suspended in the interspace.
7. Winter Nighttime U-Factor: 0.35 maximum.
8. Summer Daytime U-Factor: 0.38 maximum.
9. Solar Heat Gain Coefficient: **0.61** maximum.

PART 3 - EXECUTION

3.1 GLAZING

- A. General: Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
 1. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
 2. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
 3. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
 4. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
 5. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
 6. Provide spacers for glass lites where length plus width is larger than **50 inches (1270 mm)**.
 7. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- B. Tape Glazing: Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
 1. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.
 2. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
 3. Apply heel bead of elastomeric sealant.
 4. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
 5. Apply cap bead of elastomeric sealant over exposed edge of tape.

- C. Gasket Glazing (Dry): Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
1. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
 2. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
 3. Install gaskets so they protrude past face of glazing stops.
- D. Sealant Glazing (Wet): Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
1. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
 2. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.2 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.
- B. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:

1. Interior gypsum board.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

PART 2 - PRODUCTS

2.1 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. American Gypsum Co.
- b. BPB America Inc.
- c. G-P Gypsum.
- d. Lafarge North America Inc.
- e. National Gypsum Company.
- f. PABCO Gypsum.
- g. Temple.
- h. USG Corporation.

- B. Type X:

- C. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.

2.2 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet
2. Shapes:
 - a. Cornerbead.

2.3 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 1. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 1. Use screws complying with ASTM C 954 for fastening panels to steel members from **0.033 to 0.112 inch (0.84 to 2.84 mm)** thick.
 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

3.2 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.

3.3 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below:
 - 1. Level 2:

3.4 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ceramic tile.
 - 2. Stone thresholds.
 - 3. Waterproof membrane.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples:
 - 1. Each type and composition of tile and for each color and finish required.
 - 2. Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.
 - 3. Stone thresholds in 6-inch (150-mm) lengths.

1.3 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.
 - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

- A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. Tile Type: Glazed paver tile.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Crossville, Inc.
 - c. Daltile; Division of Dal-Tile International Inc.
 - d. Florida Tile Industries, Inc.
 - e. Florim USA.
 - f. Interceramic.
 - g. Lone Star Ceramics Company.
 - h. Seneca Tiles, Inc.
 - i. United States Ceramic Tile Company.

2. Composition: Porcelain.
3. Face Size: **7-7/8 by 7-7/8 inches (200 by 200 mm)**
4. Thickness: **1/4 inch (6.35 mm)**.
5. Face: Slip resistant with cushion edges.
6. Finish: Bright, opaque glaze.
7. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
8. Grout Color: As selected by Architect from manufacturer's full range.

C. Tile Type: Glazed wall tile.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Daltile; Division of Dal-Tile International Inc.
 - c. Florida Tile Industries, Inc.
 - d. Florim USA.
 - e. Seneca Tiles, Inc.
 - f. United States Ceramic Tile Company.
2. Module Size: **6 by 6 inches (152 by 152 mm)**.
3. Thickness: **5/16 inch (8 mm)**.
4. Face: Plain with cushion edges.
5. Finish: Bright, opaque glaze.
6. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
7. Grout Color: As selected by Architect from manufacturer's full range.
8. Mounting: Factory, back mounted.
9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved, module size **6 by 6 inches (152 by 152 mm)**.
 - b. Wainscot Cap: Bullnose cap, module size **6 by 6 inches (152 by 152 mm)**.
 - c. External Corners for Thin-Set Mortar Installations: Bullnose shape, same size as adjoining flat tile.
 - d. Internal Corners: Field-buttet square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

D. Accessories: Provide vitreous china accessories of type and size indicated, suitable for installing by same method as adjoining wall tile.

1. One soap holder for each shower indicated.
2. Color and Finish: Match adjoining glazed wall tile

2.2 THRESHOLDS

A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.

1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to **1/16 inch (1.5 mm)** above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to **1/2 inch (12.7 mm)** or less above adjacent floor surface.

B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Match Architect's sample.
2. Description: As selected by Architect from manufacturer's full range of colors.

2.3 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated.
- B. Fabric-Reinforced, Modified-Bituminous Sheet: Self-adhering, SBS-modified-bituminous sheet with woven reinforcement facing; 0.040-inch (1.01-mm) nominal thickness.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. National Applied Construction Products, Inc.; Strataflex.

2.4 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
- B. Dry-Set Portland Cement Mortar (Thin Set): ANSI A118.1.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. Southern Grouts & Mortars, Inc.
 - d. Summitville Tiles, Inc.
 - e. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Prepackaged, dry-mortar mix to which only water must be added.
 - 3. For floor applications.
- C. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. Mer-Kote Products, Inc.
 - d. Southern Grouts & Mortars, Inc.
 - e. Summitville Tiles, Inc.
 - f. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Prepackaged, dry-mortar mix to which only water must be added.
 - 3. For wall applications, provide nonsagging mortar.
- D. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Minerals & Chemicals, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Mer-Kote Products, Inc.
 - e. Southern Grouts & Mortars, Inc.
 - f. Summitville Tiles, Inc.

- g. TEC; a subsidiary of H. B. Fuller Company.
- E. Organic Adhesive: ANSI A136.1, Type I.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DAP Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Southern Grouts & Mortars, Inc.
 - e. Summitville Tiles, Inc.
 - f. TEC; a subsidiary of H. B. Fuller Company.

2.5 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10.
- B. Polymer-Modified Tile Grout: ANSI A118.7.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Laticrete International, Inc.
 - b. MAPEI Corporation.
 - c. Southern Grouts & Mortars, Inc.
 - d. Summitville Tiles, Inc.
 - e. TEC; a subsidiary of H. B. Fuller Company.
 - 2. Polymer Type: Dry, redispersible form, prepackaged with other dry ingredients.
- C. Water-Cleanable Epoxy Grout: ANSI A118.3.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Minerals & Chemicals, Inc.
 - b. Laticrete International, Inc.
 - c. MAPEI Corporation.
 - d. Mer-Kote Products, Inc.
 - e. Southern Grouts & Mortars, Inc.
 - f. Summitville Tiles, Inc.
 - g. TEC; a subsidiary of H. B. Fuller Company.
- D. Grout for PregROUTed Tile Sheets: Same product used in factory to pregROUT tile sheets.

2.6 ELASTOMERIC SEALANTS

- A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."
 - 1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

- B. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
 - b. Dow Corning Corporation; Dow Corning 786.
 - c. GE Silicones, a division of GE Specialty Materials; Sanitary 1700.
 - d. Laticrete International, Inc.; Latacil Tile & Stone Sealant.
 - e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - f. Tremco Incorporated; Tremsil 600 White.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout.
 - b. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
 - c. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
 - d. TEC, a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone Grout Sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped **1/4 inch per foot (1:50)** toward drains.

- C. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Paver Tile: 1/4 inch (6.35 mm).
 - 2. Glazed Wall Tile: 1/16 inch (1.6 mm).
- F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- H. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
- I. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

- J. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

3.4 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

- 1. Tile Installation F112: Cement mortar bed (thickset) bonded to concrete; TCA F112.

B. Interior Wall Installations, CMU wainscot:

- 1. Tile Installation W245: Thin-set mortar, Organic adhesive on coated glass-mat, water-resistant gypsum backer board; TCA W245.
 - a.

C. Interior Wall Installations, Metal Studs or Furring:

- 1. Tile Installation W243: Thin-set mortar on gypsum board; TCA W243.
- 2. Tile Installation W244: Thin-set mortar on cementitious backer units; TCA W244.
- 3. Tile Installation W245: Thin-set mortar, Organic adhesive on coated glass-mat, water-resistant gypsum backer board; TCA W245.

D. Bathtub Wall Installations, Wood or Metal Studs or Furring:

- 1. Tile Installation B413: Thin-set mortar, Organic adhesive on water-resistant gypsum board; TCA B413.

E. Shower Receptor and Wall Installations, Wood or Metal Studs or Furring:

- 1. Tile Installation B415: Thin-set mortar on cementitious backer units/fiber cement underlayment; TCA B415.

END OF SECTION 093000

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Samples: For each type of finish-coat material indicated.

1.3 QUALITY ASSURANCE

- A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5.
 - 1. Wall Surfaces: Provide samples on at least 50 sq. ft. (5 sq. m).
 - 2. Final approval of colors will be from benchmark samples.

1.4 PROJECT CONDITIONS

- A. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.
- B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).
- C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).
- D. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.5 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
 - 1. Quantity: 3 percent, but not less than 1 gal. (3.8 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. ICI Dulux Paint Centers (ICI Dulux Paints).
 - 2. PPG Industries, Inc. (Pittsburgh Paints).
 - 3. Sherwin-Williams Co. (Sherwin-Williams).
 - 4. Manufacturer's approval by Architect prior to bidding.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
- B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
- C. Colors: As selected from manufacturer's full range.

2.3 PREPARATORY COATS

- A. Concrete Unit Masonry Block Filler: High-performance latex block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
- B. Exterior Primer: Exterior alkyd or latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
 - 1. Ferrous-Metal and Aluminum Substrates: Rust-inhibitive metal primer.
 - 2. Zinc-Coated Metal Substrates: Galvanized metal primer.
 - 3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.
- C. Interior Primer: Interior latex-based or alkyd primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.
 - 1. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer.
 - 2. Zinc-Coated Metal Substrates: Galvanized metal primer.
 - 3. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.4 EXTERIOR FINISH COATS

- A. Exterior Semigloss Acrylic Enamel:
 - 1. ICI Dulux Paints; 2406-XXXX Dulux Professional Exterior 100 Percent Acrylic Semi-Gloss Finish.
 - 2. Pittsburgh Paints; 6-900 Series SpeedHide Exterior House & Trim Semi-Gloss Acrylic Latex Paint.
 - 3. Sherwin-Williams; A-100 Latex Gloss A8 Series.

- B. Exterior Full-Gloss Acrylic Enamel for Ferrous and Other Metals:
 - 1. ICI Dulux Paints; 3028-XXXX Dulux Interior/Exterior Acrylic Gloss Finish.
 - 2. Pittsburgh Paints; 90-300 Series Pitt-Tech One Pack Interior/Exterior High Performance Waterborne High Gloss DTM Industrial Enamels.
 - 3. Sherwin-Williams; DTM Acrylic Coating Gloss (Waterborne) B66W100 Series.

2.5 INTERIOR FINISH COATS

- A. Interior Semigloss Acrylic Enamel: All metal only.
 - 1. ICI Dulux Paints; 1406-XXXX Dulux Professional Acrylic Semi-Gloss Interior Wall & Trim Enamel.
 - 2. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex.
 - 3. Sherwin-Williams; ProMar 200 Interior Latex Semi-Gloss Enamel B31W200 Series.
- B. Interior Semigloss Alkyd Enamel:
 - 1. ICI Dulux Paints; 1516-XXXX Ultra-Hide Alkyd Semi-Gloss Interior Wall & Trim Enamel.
 - 2. Pittsburgh Paints; 6-1110 Series SpeedHide Interior Enamel Wall & Trim Semi-Gloss Oil.
 - 3. Sherwin-Williams; ProMar 200 Interior Alkyd Semi-Gloss Enamel B34W200 Series.

2.6 INTERIOR WOOD STAINS AND VARNISHES

- A. Open-Grain Wood Filler:
 - 1. ICI Dulux Paints; none required.
 - 2. Pittsburgh Paints; none required.
 - 3. Sherwin-Williams; Sher-Wood Fast-Dry Filler.
 - 4. Sherwin-Williams; none recommended.
- B. Interior Wood Stain: Alkyd based.
 - 1. ICI Dulux Paints; 1700-XXX WoodPride Interior Solventborne Wood Finishing Stain.
 - 2. Pittsburgh Paints; 77-560 Rez Interior Semi-Transparent Oil Stain.
 - 3. Sherwin-Williams; Wood Classics Interior Oil Stain A-48 Series.
- C. Clear Sanding Sealer: Fast-drying alkyd based.
 - 1. ICI Dulux Paints; 1902-0000 WoodPride Interior Satin Polyurethane Varnish.
 - 2. Pittsburgh Paints; 6-10 SpeedHide Quick-Drying Interior Sanding Wood Sealer and Finish.
 - 3. Sherwin-Williams; Wood Classics Fast Dry Sanding Sealer B26V43.
- D. Interior Alkyd- or Polyurethane-Based Clear Satin Varnish:
 - 1. ICI Dulux Paints; 1902-0000 WoodPride Interior Satin Polyurethane Varnish.
 - 2. Pittsburgh Paints; 77-7 Rez Varnish, Interior Satin Oil Clear.
 - 3. Sherwin-Williams; Wood Classics Fast Dry Oil Varnish, Satin A66-300 Series.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application.

- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
- C. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
- D. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
 - 2. Cementitious Materials: Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
 - 3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
 - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
 - b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and back sides of wood, including cabinets, counters, cases, and paneling.
 - c. If transparent finish is required, backprime with spar varnish.
 - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on back side.
 - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
 - 4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC's recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer and according to SSPC-SP 6/NACE No. 3.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
 - 5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- E. Material Preparation:
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

- F. Exposed Surfaces: Include areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 2. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
 3. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
 4. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
 5. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
- G. Sand lightly between each succeeding enamel or varnish coat.
- H. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Omit primer over metal surfaces that have been shop primed and touchup painted.
 2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
- I. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
- J. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness of the entire system as recommended by manufacturer.
- K. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.
- L. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- M. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- N. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- O. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
- P. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

3.2 CLEANING AND PROTECTING

- A. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
- B. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- C. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
 - 1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.3 EXTERIOR PAINT SCHEDULE

- A. Unit Masonry:
 - 1. Acrylic Finish: Two finish coats over a block filler.
 - a. Block Filler: Concrete unit masonry block filler.
 - b. Finish Coats: Exterior semigloss acrylic enamel.
- B. Exterior Gypsum Soffit Board:
 - 1. Acrylic Finish: Two finish coats over an exterior alkyd- or alkali-resistant primer.
 - a. Primer: Exterior gypsum soffit board primer.
 - b. Finish Coats: Exterior semigloss acrylic enamel.
- C. Wood Trim:
 - 1. Acrylic-Enamel Finish: One finish coat over a primer.
 - a. Primer: Exterior wood primer for acrylic enamels.
 - b. Finish Coats: Exterior semigloss acrylic enamel.
- D. Ferrous Metal:
 - 1. Alkyd-Enamel Finish: Two finish coats over a rust-inhibitive primer.
 - a. Primer: Exterior ferrous-metal primer (not required on shop-primed items).
 - b. Finish Coats: Exterior full-gloss alkyd enamel.
- E. Zinc-Coated Metal:
 - 1. Alkyd-Enamel Finish: Two finish coats over a galvanized metal primer.
 - a. Primer: Exterior galvanized metal primer.
 - b. Finish Coats: Exterior full-gloss alkyd enamel.

3.4 INTERIOR PAINT SCHEDULE

- A. Unit Masonry:
 - 1. Acrylic Finish: Three finish coats over a block primer.

- a. Block Primer: concrete unit masonry block filler.
- b. Finish Coats: Interior semigloss acrylic enamel or epoxy in wet areas.

B. Wood:

- 1. Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes.
 - b. Finish Coats: Interior semigloss acrylic enamel.

C. Ferrous Metal:

- 1. Alkyd-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior ferrous-metal primer.
 - b. Finish Coats: Interior semigloss alkyd enamel.

D. Zinc-Coated Metal:

- 1. Alkyd-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior zinc-coated metal primer.
 - b. Finish Coats: Interior semigloss alkyd enamel.

END OF SECTION 099100

SECTION 099860- FIBERGLASS REINFORCED WALL AND CEILING PANELS

1.1 - GENERAL

- A. Types of FRP surfaced paneling for Toilet Room wainscot.
 - 1. Minimum 1/8" FRP board bonded to 5/8" Gypsum Wall Board with full-buttered adhesive and mechanical anchors.
- B. Product Data: Submit for each paneling specified. Include installation and maintenance instructions, durability, fade resistance, physical characteristics, and flame resistance characteristics.
- C. Shop Drawings: Show location and extent of each paneling specified; include indication of termination points. Show installation details at nonstandard conditions.
 - 1. Submit manufacturer's standard 4 by 4 inch samples showing full range of color specified and patterns available.
- D. Maintenance Data: Submit maintenance instructions for each paneling for inclusion in Operating and Maintenance Manual.
 - 1. Include methods and frequency recommended for maintaining optimum condition and precautions on use of cleaning materials which could be detrimental to finishes or might damage paneling.

1.2 - PRODUCTS

- A. Wall panel
 - 1. approved manufacturer's:
 - a. Kemply FRP by Kemlite Company, 1-800-435-0080
 - b. Tufliner by BP Chemicals, Inc., 1-800-443-4566
 - c. Lasco Panel Products, 1-800-626-1220
 - d. Nudo Products, Inc., 1-800-826-4132
 - e. Sequentia Inc., 1-619-273-2331
 - f. Stennex by United Panel, Howe Building Products, 487-9618
 - 2. Color and texture shall be selected by the Architect from manufacturer's full range of colors and textures.
 - 3. Panels shall have normal water absorption property of 0.4% and normal coefficient of linear expansion of 1.7×10^{-5} .
 - 4. Panels shall meet flame spread and smoke development ratings specified for Class C(III) interior (exterior) finish under the 1994 Uniform Building Code.
- B. Moldings: Furnish moldings and trim fabricated by the same manufacturer as the paneling for vertical and horizontal joints and for perimeter edging. All joints and edges shall receive trim. Color to match panel color.
- C. Anchorage Devices: Factory manufactured anchors finished to match panel provided by panel manufacturer. Panel anchorage shall be spaced not to exceed 12" O/C parallel to framing members and 24" O/C at right angles to framing members. Edges shall be anchored at 12" O/C. Conceal fasteners.
- D. Adhesive: In accordance with manufacturer's requirements to bond FRP panel to backing.

1.3 - EXECUTION

- A. Store inside in original undamaged packaging, in a well-ventilated area protected from weather, moisture, soiling, extreme temperatures and humidity. Do not store rolled goods upright; lay flat, blocked off the ground to prevent sagging and warping. Maintain temperature in storage area above 40 deg F (4 deg C).
- B. Maintain constant minimum temperature of 60 deg F (16 deg C) in installation areas at least 10 days before and 10 days after application of materials.
- C. Illuminate installation areas using the permanent lighting system; temporary lighting alone will not be acceptable.
- D. Schedule installation to minimize damage and soiling.
- E. Replacement Materials: After completion, deliver not less than 16 square feet of each paneling type, color, and pattern and from the same run as materials installed.
 - 1. Package with protective wrapping, identified with appropriate labels as replacement material.
- F. Paneling Installation: Install wall and ceiling in accordance with manufacturer's recommendations using concealed mechanical anchorage and adhesive as directed by the manufacturer for this expressed purpose.
 - 1. Install factory manufactured anchors finished to match panel surface at maximum 24" o/c in each direction in field of panel. Provide additional anchors at panel edges to prevent panel sag.
 - 2. No sags will be allowed in installation.
- G. Molding installation: Install in longest practicable lengths, by concealed mechanical anchors at maximum 18" o/c to substrate in accordance with manufacturer's instructions. Tightly butt end joints and miter all corners.
 - 1. Install continuous edge trim on all exposed edges.
 - 2. Assure uniform alignment of trim.
- H. Remove surplus materials, rubbish, and debris resulting from wall covering installation upon completion of work, and leave areas of installation in neat, clean condition.
 - 1. Clean all adhesive and other residue from panel surfaces.
- I. Provide protection needed to ensure that wall and ceiling paneling will be without deterioration or damage at time of substantial completion.

END OF SECTION 099860

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Public-use washroom accessories.
 - 2. Public-use shower room accessories.
 - 3. Warm-air dryers.
 - 4. Underlavatory guards.
 - 5. Custodial accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule:
 - 1. Identify locations using room designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. General Accessory Manufacturing Co. (GAMCO).
- C. Toilet Tissue (Roll) Dispenser TTD:
 - 1. Description: Double-roll dispenser.
 - 2. Mounting: Surface mounted.
 - 3. Capacity: Designed for **4-1/2- or 5-inch- (114- or 127-mm-)** diameter tissue rolls.
 - 4. Material and Finish: Stainless steel, No. 4 finish (satin).
- D. Grab Bar GB:
 - 1. Mounting: Flanges with concealed fasteners.
 - 2. Material: Stainless steel, **0.05 inch (1.3 mm)** thick.
 - a. Finish: Smooth, No. 4, satin finish.
 - 3. Outside Diameter: **1-1/4 inches (32 mm)**.

- E. Mirror Unit MU:
1. Frame: Stainless steel, fixed tilt.
 - a. Corners: Welded and ground smooth.
 2. Integral Shelf: 5 inches (127 mm) deep.
 3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
 4. Size: As indicated on Drawings.

2.2 PUBLIC-USE SHOWER ROOM ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. A & J Washroom Accessories, Inc.
 2. American Specialties, Inc.
 3. Bobrick Washroom Equipment, Inc.
 4. Bradley Corporation.
 5. General Accessory Manufacturing Co. (GAMCO).
- B. Shower Curtain Rod :
1. Description: 1-1/4-inch (32-mm) OD; fabricated from nominal 0.05-inch- (1.3-mm-) thick stainless steel.
 2. Mounting Flanges: Stainless-steel flanges designed for exposed tamper proof fasteners.
 3. Finish: No. 4 (satin).
- C. Shower Curtain:
1. Size: Minimum 6 inches (152 mm) wider than opening by 72 inches (1828 mm) high.
 2. Material: Nylon-reinforced vinyl, minimum 10-oz. (284-g) or 0.008-inch- (0.2-mm-) thick vinyl, with integral antibacterial agent.
 3. Color: White.
 4. Grommets: Corrosion resistant at minimum 6 inches (152 mm) o.c. through top hem.
 5. Shower Curtain Hooks: Chrome-plated or stainless-steel, spring wire curtain hooks with snap fasteners, sized to accommodate specified curtain rod. Provide one hook per curtain grommet.
- D. Soap Dish See Tile Work:
- E. Robe Hook :
1. Description: Double-prong unit.
 2. Material and Finish: Stainless steel, No. 4 finish (satin).
- F. ADA Shower Seat:
1. Ultra-heavy duty ADA compliant fold-down shower seat, minimum 14.5 inches deep by 16 inches wide wall mounted, wood grain phenolic slat type seat, stainless steel support tubing and operating hardware by Barrier Free Architectural Products or approved equal.

2.3 WARM-AIR DRYERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Dryer, Inc.
 - 3. American Specialties, Inc.
 - 4. Bobrick Washroom Equipment, Inc.
 - 5. Bradley Corporation.
 - 6. Excel Dryer Corporation.
 - 7. General Accessory Manufacturing Co. (GAMCO).
 - 8. World Dryer Corporation.
- B. Warm-Air Dryer:
 - 1. Mounting: Surface mounted.
 - 2. Operation: Electronic-sensor activated with timed power cut-off switch.
 - a. Operation Time: 30 to 40 seconds.
 - 3. Cover Material and Finish: Stainless steel, No. 4 finish (satin)] [Molded plastic, gray.
 - 4. Electrical Requirements: 115 V, 20 A, 2300 W.

2.4 UNDERLAVATORY GUARDS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: The design for accessories is based on products indicated. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
 - 1. Plumberex Specialty Products, Inc.
 - 2. TCI Products.
 - 3. Truebro, Inc.
- D. Underlavatory Guard:
 - 1. Basis-of-Design Product:
 - 2. Description: Insulating pipe covering for supply and drain piping assemblies, that prevent direct contact with and burns from piping, and allow service access without removing coverings.
 - 3. Material and Finish: Antimicrobial, molded-plastic, white.

2.5 CUSTODIAL ACCESSORIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. A & J Washroom Accessories, Inc.
 - 2. American Specialties, Inc.
 - 3. Bobrick Washroom Equipment, Inc.
 - 4. Bradley Corporation.
 - 5. General Accessory Manufacturing Co. (GAMCO).

B. Mop and Broom Holder:

1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
2. Length: **36 inches (914 mm)**.
3. Mop/Broom Holders: Four, spring-loaded, rubber hat, cam type.
4. Material and Finish: Stainless steel, No. 4 finish (satin).

- a. Shelf: Not less than nominal **0.05-inch- (1.3-mm-)** thick stainless steel.

2.6 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

END OF SECTION 102800

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Operation and maintenance data.
- C. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
- C. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure of hydrostatic test according to NFPA 10.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each mounting bracket indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International Ltd.

- c. Badger Fire Protection; a Kidde company.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
 - h. Larsen's Manufacturing Company.
 - i. Moon-American.
 - j. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
 - k. Potter Roemer LLC.
 - l. Pyro-Chem; Tyco Safety Products.
2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type: UL-rated 1-A: 10-BICC, 10-lb. nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.2 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- a. Amerex Corporation.
 - b. Ansul Incorporated; Tyco International Ltd.
 - c. Badger Fire Protection; a Kidde company.
 - d. Buckeye Fire Equipment Company.
 - e. Fire End & Croker Corporation.
 - f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
 - g. Larsen's Manufacturing Company.
 - h. Potter Roemer LLC.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
- a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
1. Mounting Brackets: **54 inches (1372 mm)** above finished floor to top of fire extinguisher.

- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 220500 - PLUMBING PRODUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 GENERAL CONDITIONS:

- A. Complete installation of each fixture shall include trap and accessories with accessible stop or control valve in each hot and cold water branch supply line. Caulk between fixture and countertop with white silicone non-absorbent caulking compound. Point all edges.
- B. Install fixtures and fittings per local codes and manufacturer's instructions. Do not use plastic flexible water piping.

PART 2 - PRODUCTS

2.1 P-1 ACCESSIBLE WATER CLOSET

- A. Kohler "Highcrest" K-4302-C, elongated bowl, white, floor mount, top spud with heavy duty open front seat. Siphon jet action requires 1.6 GPM flush valve. Flush valve to be battery powered sensor type by Sloan, or approved equal by Zurn or Delaney. Mount at ADA height. Provide carrier.
- B. Approved alternate by American Standard, Crane, or Eljer.

2.2 P-2 WATER CLOSET

- A. Kohler "Highcrest" K-4302-C, elongated bowl, white, floor mount, top spud with heavy duty open front seat. Siphon jet action requires 1.6 GPM flush valve. Flush valve to be battery powered sensor type by Sloan, or approved equal by Zurn or Delaney. Provide carrier.
- B. Approved alternate by American Standard, Crane, or Eljer.

2.3 P-3 ACCESSIBLE WALL HUNG LAVATORY

- A. Kohler K-2030, "Greenwich", 20" x 18" wall hung, vitreous china, dual front overflow, D-shaped bowl, 8" centers, Kohler K-10950-4 battery powered electronic faucet, or equal by Zurn, and 0.5 GPM flow restrictor, Chicago 327 open grid drain; chrome plated flexible supplies with loose key stops, cast brass P-trap with cleanout plug, concealed arm chair carrier with foot support. Insulate all piping underneath. Fixture must comply with all ADA requirements.
- B. Approved alternate by American Standard, or Eljer.

2.4 P-4 WALL HUNG LAVATORY

- A. Kohler K-2030, "Greenwich", 20" x 18" wall hung, vitreous china, dual front overflow, D-shaped bowl, 8" centers, Kohler K-10950-4 battery powered electronic faucet, or equal by

Zurn, and 0.5 GPM flow restrictor, Chicago 327 open grid drain; chrome plated flexible supplies with loose key stops, cast brass P-trap with cleanout plug, concealed arm chair carrier with foot support.

- B. Approved alternate by American Standard, or Eljer.

2.5 P-5 ADA SHOWER ASSEMBLY

- A. Pressure balance mixing valve with integral stops and adjustable stop screw. Wall/hand shower with flexible 5' metal hose with inline vacuum breaker, wall connection and flange. 30" slide bar for hand shower mounting. Attached soap dish and top cap. Stainless steel covering over piping to be 18 gauge with #4 brush finish. Symmons Model 1-801S-FSB.
- B. Approved alternate by Kohler, American Standard, or Eljer.

2.6 P-6 SHOWER ASSEMBLY

- A. Pressure balance mixing valve with integral stops and adjustable stop screw. Showerhead with 1 GPM flow restrictor on institutional type head bracket furring. Attached soap dish and top cap. Stainless steel covering over piping to be 18 gauge with #4 brush finish. Symmons Model 1-801S.
- B. Approved alternate by Kohler, American Standard, or Eljer.

2.7 P-7 SHOWER FLOOR DRAIN

- A. Deep seal trap and chrome plated strainer, Zurn 415 with Z1000 trap. Use Zurn 415C with clamping collar where floor membrane is used.
- B. Approved alternate by Wade, or Smith.

2.8 P-8 FLOOR DRAIN

- A. Deep seal trap and bronze strainer, Zurn 415 with Z1000 trap. Trap primer fitting.
- B. Approved alternate by Wade, or Smith.

2.9 P-9 SERVICE SINK

- A. Kohler "Whitby" K-6710, floor mount corner style, with rim guard; 2" grid drain with strainer and socket, "Knoxford" K-8928-CP wall mounted faucet with, stops, and vacuum breaker, 5-foot rubber hose and wall hook.
- B. Approved alternate by ProSet, American Standard, or Eljer.

2.10 P-10 NON-FREEZE WALL HYDRANT

- A. All brass non-freeze hydrant with 12" long stem, complete with vacuum breaker.
- B. Smith #5609 or approved alternate by Woodford or Zurn.

2.11 P-11 EQUIPMENT ROOM FLOOR DRAIN

- A. Deep seal trap and heavy duty strainer, Zurn 415 with Z1000 trap. Use Zurn 415C with clamping collar where floor membrane is used.
- B. Approved alternate by Wade, or Smith.

2.12 P-12 THERMOSTATIC MIXING VALVE

- A. General: The Thermostatic Mixing Valve (TMV) shall be of chrome-plated DZR brass/polymer construction. TMV shall have NPT inlets and outlet with integral inlet spring loaded check valves and strainers, and an optional top or bottom mixed water outlet. TMV shall be equipped with a maximum temperature limiting and single temperature locking feature. TMV shall have dual thermostats for increased accuracy and to provide redundancy in case of individual thermostat failure.
- B. Materials of construction and items included shall be:
 - 1. Chrome-plated DZR brass/polymer
 - 2. 1" NPT inlets and outlet
 - 3. Optional top or bottom mixed water outlet
 - 4. Integral inlet check valves and strainers
 - 5. Dual Thermostats
- C. Performance: TMV shall be so designed that all of the internal operating components are enclosed in a one-piece, "sealed for life" replaceable cartridge for ease of service. TMV shall be capable of controlling mixed water temperatures +/-2°F at flow rates between 1 and 24 gpm. TMV shall be capable of delivering a mixed water temperature that is within 5°F of either inlet supply temperature. TMV shall be compliant with ASSE Standard 1017 and CSA B125 and shall be so certified and identified. The Thermostatic Mixing Valve shall include all of the following capabilities:
 - 1. Maintains mixed water temperatures +/-2°F at flow rates between 1 and 24 gpm
 - 2. Delivers mixed water temperature within 5°F of either inlet supply temperature
 - 3. Operational pressure of 10 - 150 psig
 - 4. Thermal shutdown mode upon inlet supply failure
- D. Armstrong "Rada" model 320 or equal by Symmons or Leonard.

2.13 P-13 INDOOR WALL HYDRANT

- A. Chicago model 15T with E27 vacuum breaker.

2.14 TRAP PRIMER

- A. Tail piece type: Sioux Chief "Trap-Ease" meeting ASSE 1044. Approved alternate by J.R. Smith or Zurn.

2.15 SHOCK ARRESTORS

- A. Wilkins Model 1250-B or approved alternate BY Sioux Chief.

2.16 CLEANOUTS

- A. Floor type - Zurn Z-1420-2.
- B. Wall Type - Zurn Z-1445-1.
- C. Resilient Flooring - Zurn Z-1400-6.
- D. Exposed drain lines - Zurn Z-1440-A.
- E. General purpose - Zurn Z-1440-A.
- F. Approved alternates by Smith, Wade, or Josam.

2.17 DIRECT VENT GAS WATER HEATERS

- A. Water heater(s) shall be of the seamless glass lined steel tank construction in which the glass coating is applied to the water side surfaces of the tank after the tank has been assembled and welded. The condensing flue coil shall be coated on the flue gas side with acid resistant glass lining designed for use in condensing heaters.
- B. The heater(s) shall be suitable for venting with 3" or 4" diameter PVC pipe for a total equivalent distance of 50' to 120'. Alternative venting: the heater shall be suitable for sealed combustion direct venting using a 3" or 4" diameter PVC air intake pipe and 3" or 4" diameter PVC exhaust pipe for a total distance of 50' to 120' equivalent feet of vent and 50' to 120' equivalent feet of intake.
- C. The heater shall be factory assembled and tested.
- D. The power burner shall be of a design that requires no special calibrations on start up.
- E. The heater(s) shall be approved for 0" clearances to combustibles.
- F. The control shall be an integrated solid state temperature and ignition control device with integral diagnostics, LED fault display capability and a digital display of temperature settings.
- G. The tanks shall be foam insulated and equipped with a ASME rated temperature pressure relief valve.
- H. The water heater shall be UL listed and exceed the minimum efficiency requirements of ASHRAE/IES 90.1-1999. This heater shall be listed by SCAQMD Rule 1146.2 Low Nox.
- I. Operation of the heater in a closed system where thermal expansion has not been compensated for with a properly sized thermal expansion tank will void the warranty.
- J. Install floor mounted mechanical channel seismic restraint on water heaters.
- K. Approved Manufacturers: Bradford-White or equal by A.O. Smith.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install accordance with all codes and manufacturer's instructions.
- B. Install floor mounted heavy duty seismic restraint on water as described above.

END OF SECTION 220500

SECTION 220553 – TESTING OF PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 VERIFICATION:

- A. All tests shall be verified by the Owner's Representative. The contractor shall test the operation of each safety and high limit control to insure proper installation and operation. Any defective devices shall be replaced.

1.3 TESTS AND ADJUSTMENTS:

- A. Before any piping is covered, tests shall be made in the presence of the Owner's Representative and any leaks or defective work corrected. No caulking of threaded work will be permitted. Following minimum pressures shall be used for testing:
- B. Before application of insulation covering, and as far as practical before concealing any piping, all piping shall be hydrostatically tested and proved tight. Stubs shall be capped and all control valves shall be removed during the test. System may be tested in sections, providing connections to last section tested are included in each succeeding test. Following minimum pressures shall be used for testing:
 - 1. Water Piping - 50 PSIG for 4 hours.
 - 2. Gas Piping - 50 PSIG for 4 hours.
 - 3. Waste and vent piping - fill to 10' above highest level.

PART 2 - PRODUCTS

2.2 TEST EQUIPMENT:

- A. The mechanical contractor shall furnish all necessary gauges, plugs, test fans, pumps, etc., as required to conduct the tests.

PART 3 - EXECUTION

3.1 PROCEDURE:

- A. The contractor shall be responsible to conduct all tests in a safe manner, protecting the work of other trades from water or physical damage. The tests, as indicated, shall be in addition to any test as required by any governing agency. Submit all approved tests as required by any governing agency to the Owner's Representative. Each test and any necessary repairs and retest shall be performed by the contractor which installed the system.

3.2 REPORTS

- A. The contractor shall give the Owner's Representative one week notice prior to performing the tests. All tests shall be witnessed and recorded, and reports given to the Owner.

END OF SECTION 220553

SECTION 220700 - INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

- A. It is the intent of this Section of the specifications that all hot and cold surfaces of mechanical system components be insulated, unless specifically excluded herein, including existing.
- B. Insulate all new heating water lines and existing heating water lines where insulation is disturbed for construction.

PART 2 - PRODUCTS

2.1 COMPLIANCE:

- A. All insulation shall conform to the requirements of the building code and have a flame spread rating of less than 25 and smoke developed less than 50. Insulation shall be as manufactured by Johns-Manville, Owens-Corning, Armstrong, or Gustin Bacon.

2.2 WATER PIPING :

- A. All piping shall be insulated with 2-piece heavy density pipe insulation having an average "K" factor of .25 BTU at 70 degrees F mean, with all-service jacket. Thickness of insulation shall be as follows:
 - a. Domestic hot and cold water piping: 1" thick.
- B. Pipe insulation shall be mechanically fastened to pipe systems. The insulation shall be covered with an all-service jacket. Fittings shall be insulated with mitered segments of insulation material and finished with a 1/4" layer of insulating cement. Flanges and valves shall be insulated with removable and replaceable covers fabricated from oversized pipe insulation and finished with an all-service PVC jacket. Valves shall be insulated as specified for fittings.

2.3 ROUND AND RECTANGULAR DUCTS:

- A. The exterior surface of all round and rectangular low pressure exhaust air ducts in unconditioned spaces shall be wrapped with one layer of foil faced fiberglass having an R-8 insulation value. The insulation shall meet standards NFPA No. 90A and No. 90B and shall have the Underwriters' Laboratories, Inc., label. Leave marker tag where balancing dampers exist so that they may be found under insulation.

PART 3 - EXECUTION

3.1 GENERAL:

- A. The contractor shall provide a complete installation which is neat in appearance and functional. Remove all excess materials and packaging from job site.

3.2 INSULATION WORKMANSHIP:

- A. All insulation shall be applied by specialists experienced in the field, and shall be neat in appearance. Neatness in appearance shall be equated to proper insulation application procedures.

END OF SECTION 220700

SECTION 221113 - BASIC PIPING MATERIALS AND METHODS

PART 1-GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions Specification Sections, apply to this Section.

1.2 DESCRIPTION:

- A. This section specifies the basic materials and methods to be used in Division 221113.
- B. All materials shall be new and undamaged. Protect all materials to keep free from foreign materials.
- C. All materials shall be made in the United States, with a UL label. No foreign materials will be accepted.

1.3 PIPE IDENTIFICATION:

- A. All piping is to be identified as described in Section 230500.

1.4 CUTTING AND PATCHING

- A. Any cutting, patching, or filling necessary for the proper execution of this work, except as noted on drawings, shall be done by this contractor. Where any other part of the building is involved, it shall be done by a competent workman in a neat and workmanlike manner. No rough or unsightly work will be allowed, and cutting of structural members shall be done only on approval of the Owner's Representative.
- B. The attention of the contractor is directed to the requirements of running pipe through concrete slabs, walls, and beams. These conditions are to be anticipated and sleeves installed as provided for under "Sleeves". Sleeves shall be placed in structural members only where approved by the Owner's Representative.

1.5 PIPE SLEEVES AND COLLARS:

- A. Pack sleeves in sound and fire partitions with Fire Marshal approved fireproofing material and provide cover flange each side.

1.6 PIPE LOCATION AND ARRANGEMENT:

- A. All piping shall be properly racked and supported to run straight and true. All changes in direction shall be made with approved fittings.

1.7 PIPE JOINING:

- A. All joints shall be made to assure liquid-tight connections. Pipe shall be reamed at ends and free of all burrs. Clean the ends to be soldered with abrasive cloth, and apply non-corrosive flux. Solder with lead-free solder, "Silvabrite 100" or approved alternate. Underground copper pipe connections shall be brazed.

1.8 SCREWED CONNECTIONS:

- A. All pipe shall be reamed at the ends and free of all inside scale or burrs. Threads shall be cut clean and sharp, and to a length equal to 1-1/8 the length of the female thread receiving the pipe. The pipe shall be screwed in full length of the female thread.

1.9 PIPE GRADING AND SLOPE:

- A. Piping shall be uniformly graded in direction of flow as noted below:

<u>Piping</u>	<u>Fall/Rise</u>	<u>Direction</u>	<u>Per/Run</u>
Water	1"	Up	40'
Waste	1/4"	Down	1'

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS:

- A. Culinary cold water piping above grade shall be ASTM B88-78 Type "L" copper with soldered wrought copper fittings. The same piping below grade shall be Type "K". Solder fittings with lead-free solder.
- B. Waste and vent piping and roof drain piping shall be ASTM A74-82 no-hub cast iron. Roof drain coupling shall be extra-heavy duty type with four bands.
- C. Gas piping above grade shall be shall be ASTM A120-74 black steel piping. Below grade shall be plastic polyethylene PE-2406 medium density for maximum 60 psi, and PE-3408 for 60 psi and above.

2.2 HANGERS AND SUPPORTS:

- A. Vertical Piping:
 - 1. Attachment - Vertical piping shall be secured at sufficiently close intervals to keep the pipe in alignment and to carry the weight of the pipe and contents. Stacks shall be supported at their bases.
- B. Horizontal Piping:
 - 1. Supports - Horizontal piping shall be supported at sufficiently close intervals to keep it in alignment and prevent sagging. Screwed pipe (IPS) shall be supported at approximately 8-foot intervals. Where piping is run adjacent to walls or steel columns, it shall be supported from steel brackets or vertical channel hangers.
 - 2. Use unistrut brackets to attach to ceiling where called for on the plans.
- C. Furnish all hangers, inserts, brackets, anchors, etc., and all auxiliary steel necessary for the installation. All supports shall be designed in accordance with the AISC Steel Handbook and painted with one with one coat of primer and two coats enamel.
- D. Plumbers' tape, chain, or wire will not be permitted.

2.3 VALVES:

- A. Ball Valves (MSS SP-110) for use in domestic water applications (copper pipe) shall be rated for 125 PSIG WOG at 220° F, with bronze construction, threaded ends, bubble tight teflon seats (at 100 PSIG under water), with a hard chrome plated brass or stainless steel ball. The valve shall operate with flow in either direction, suitable for both throttling and tight shut off. Watts B-6001, Nibco S-580-70, or Jomar Model S-100 SS with solder ends.

2.4 PRESSURE REDUCING VALVES:

- A. Watts Series U5, model U5B LP, bronze construction, complying with ASSE Standard No. 1003.

2.5 GAUGES:

- A. Gauges shall be by Ashcroft, Marsh, Trerice, Marshalltown, or Weiss.

PART 3 - EXECUTION

3.1 TESTING:

- A. All piping shall be tested prior to applying insulation or concealing in partitions, wall, etc.

3.2 ACCESS:

- A. All valves and equipment shall be located to allow easy access for inspection, test and balance, and operation.
- B. Locate piping, valves, etc., to allow easy access to and maintenance of equipment.
- C. Provide drain funnel and piping to nearest floor drain for backflow preventers.

END OF SECTION 221113

SECTION 230500 – COMMON WORK RESULTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 GENERAL CONDITIONS:

- A. The contractor shall carefully read the General Conditions of the Contract and all information to bidders which, with the following specifications for heating, cooling, plumbing, exhaust, ventilation, and temperature control are a part of the Contract.
- B. The Test and Balance Contractors shall submit their bids to the General Contractors.

1.3 WORK INCLUDED:

- A. The work to be done under this section includes the furnishing of all labor, materials, equipment, accessories required to complete all heating, air conditioning, ventilating, plumbing, and other mechanical systems as show on plans and described in these specifications or required to properly complete the entire work.

1.4 CODES AND ORDINANCES:

- A. The work shall be installed in accordance with the following codes: 2006 IBC, 2006 IMC, 2006 IPC, 2005 NEC, 90.1 Energy Code, 2004 Utah Pressure Vessel code, Utah Health Department Rules, and any other state, local or government code or ordinance that governs the type of work covered by these specifications. Should the drawings conflict with the code, the code shall govern the proper installation of the work, and no extra charge shall be made for such change.

1.5 SUBSTITUTIONS AND PACKAGE PRICING:

- A. Suppliers who group products into packages for package pricing must breakout individual prices at the request of the contractor, engineer, or owner. Suppliers who refuse to breakout prices, especially those who may have a sole-source item, will not be allowed to submit prices to the contractors, and the engineer will issue an addendum to omit their products from the project.

1.6 FEES AND PERMITS:

- A. This contractor shall obtain all necessary permits and pay all fees required in connection with the work.

1.7 SITE INSPECTION AND EXAMINATION OF DRAWINGS:

- A. The contractor shall carefully study all drawings and specifications pertaining to the work. If any of the work as laid out, indicated, or specified is contrary or conflicts with any governing ordinances or regulations, the same shall be reported to the Owner's representative before submitting a bid. The Owner's representative will then issue instructions as to procedure. The contractor shall carefully examine the building site and compare the drawings with existing conditions. By the act of submitting a bid, the contractor shall be deemed to have made such examination, and to have accepted such conditions, and to have made allowance therefore in preparing his bid.

1.8 RECORD DRAWINGS:

- A. The contractor shall provide and keep up to date a complete record set of ozalid prints

which shall be corrected daily to show change from the original drawings and specifications, the size and kind of equipment, and runs of all pipes, etc. Prints for this purpose will be furnished by the Owner's Representative. This set of drawings shall be kept on the work and shall be used only as record set. Upon completion of the work, the set of record drawings shall be turned over to the Owner's Representative.

1.9 GUARANTEE:

- A. By the acceptance of the contract award for the work herein described, the contractor assumes the full responsibility imposed by the guarantee as set forth herein and should protect himself through proper guarantee from equipment and specialty manufacturers and subcontractors as their interests may appear.
- B. All materials and equipments provided and installed under this division of the specifications shall be guaranteed for a period of **one (1) year** from the date of substantial completion and acceptance by the Owner, unless specifically noted elsewhere in the specification. Should any trouble develop during this period due to defective materials to correct the trouble without any cost noticed at the time of installation and/or during the guarantee period shall be corrected immediately to the entire satisfaction of the Owner's Representative.

1.10 PAINTING:

- A. All equipment which is to be furnished in factory prefinished conditions by the mechanical contractor shall be left without mark, scratch, or impairment to finish upon completion of job. Any necessary refinishing to match original shall be done. Do not paint over nameplates, serial numbers, or other identifying marks. Paint all bare piping and bare steel brackets, etc. with one coat primer and two coats enamel. Color by Architect. Paint walls in all places where the mechanical contractor is called to do so on the plans because of new penetrations, etc.

1.11 SCHEDULES, MATERIALS, AND EQUIPMENT:

- A. As soon as practicable, and within 14 days after date of award of contract, and before commencement of work, a complete schedule of equipment and materials proposed for installation shall be submitted to the Owner's Representative. The schedule shall include catalogs, cuts, drawings, and such other descriptive data or samples that are requested by the Owner's Representative. Schedules shall include all items of equipment used. No partial submittals will be accepted. Provide four copies minimum.

1.12 OPERATING INSTRUCTIONS AND CATALOG INFORMATION:

- A. This contractor shall compile in loose-leaf binders catalogs containing the following: Master index, contractor and vendor list and phone numbers and addresses, general HVAC description, startup procedures, ATC schematics, maintenance instructions, balancing reports, and all equipment data sheets. Four copies shall be given to the Engineer for his approval.

PART 2 - PRODUCTS

2.1 MATERIALS, EQUIPMENT AND ACCESSORIES:

- A. Unless otherwise specified, all equipment, accessories, and materials shall be new and undamaged, and the workmanship shall be of the best quality for the use intended and shall be acceptable to the Owner's Representative. Equipment, accessories, and materials shall be essentially the standard products of the manufacturer, or as specified herein. Where two or more units of the same class of new equipment are required, these units shall be products of a single manufacturer.

2.2 MAGNETIC STARTERS:

- A. Contractor furnishing packaged equipment with ½ HP and larger in size (except fan coils) shall furnish factory-mounted magnetic starters on all motors. Magnetic starters shall provide both overload and under voltage protection and shall have integral hand-off-auto switch, auxiliary contacts, and pilot. Starters for all motors furnished under the mechanical section of the work will be furnished and installed by the electrical contractor. Provide heater index for all starters furnished under this division.

2.3 SLEEVES AND BOXES:

- A. For pipes passing through masonry or concrete construction, provide sleeves at least two pipe sizes larger than the pipe passing through and made from selections of steel pipe. Provide galvanized iron sleeves with collar on each side of wall for all ducts passing through similar constructions.
- B. For pipes passing through finished partitions, or ceilings, provide galvanized sheet iron sleeves of suitable size. The sleeves shall be fastened to construction to prevent creep along pipe and the sleeve ends shall be flush with finished surfaces. Provide escutcheon plates at each side of finish wall or floor or ceiling for all pipes passing through same.

PART 3 - EXECUTION

3.1 FUNCTIONING AND OPERATION OF EQUIPMENT:

- A. The final inspection, which the Owner will attend, will not take place until the Engineer is satisfied that the systems are 100% complete and functional.

3.2 CLEANING BY MECHANICAL CONTRACTOR:

- A. The contractor shall remove all stains or grease marks on walls or elsewhere caused by his workman or for which he is responsible. He shall also remove all rubbish resulting from his work, shall remove all stickers on fixtures, adjust all valves, etc., and leave the premises in first-class order.

3.3 SAFETY REGULATION:

- A. The contractor shall comply with all State, Utah National Guard, local, and OSHA safety requirements in performance with this work. (See General Conditions). This contractor shall be required to provide equipment, supervision, construction, procedures, and all other necessary items to assure safety to life or property.

END OF SECTION 230500

SECTION 230548 - SEISMIC RESTRAINT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 WORK INCLUDED:

- A. All equipment, piping, and ductwork shall be adequately restrained to resist seismic forces. Restraint of rigidly mounted ductwork and piping may conform to "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems", SMACNA/PPIC, latest edition, and calculations need not be submitted for restraint systems conforming to these guidelines.

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Products shall be made expressly for the purpose of seismic restraint, and shall be manufactured by Mason or Amber/Booth or equal.

PART 3 - EXECUTION

3.1 WORK:

- A. All work is to be done in conformance with the aforementioned Codes and References.
- B. Provide floor-mounted mechanical channel anchored to floor seismic restraint on water heaters.

END OF SECTION 230548

SECTION 233113 - AIR DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

2.2 WORK INCLUDED:

- A. Work shall include ventilation, and duct systems, and all materials, equipment, and labor required to complete the system shown on plans and specified herein.

PART 2 - PRODUCTS

2.1 HVAC DUCTWORK:

- A. Construct all ducts, plenums, etc., of the gauges specified below, unless otherwise shown. Sheets shall be free from blisters, slivers, pits, and imperfectly galvanized spots. Construct ducts using double or Pittsburgh corner seams. All seams shall be hammered and made airtight. Joints shall be caulked to prevent air leakage, using Duradyne or Hardcast sealers.
- B. Duct construction details shall comply with the latest edition of the SMACNA "Duct Construction Standards" manual. **Ducts shall be constructed as Seal Class "C" and 2" Pressure Class, unless otherwise indicated on plans.**
- C. Flange-type systems such as Ductmate are approved. Such systems must be installed so that joints are true and airtight with gaskets or duct sealer. Flange bolts are to be installed with lock washers or jam nuts.
- D. Round ducts and fittings shall be 24 gauge, United Sheet Metal Co., Metco, or Ventline. Fittings are to be constructed of 24 gauge zinc-coated steel with welded or soldered joints. All fittings shall be made by same manufacturer as the spiral lockseam conduit to facilitate a tight fit. All field joints shall be sealed with high pressure duct sealer.
- E. **Vanes with 1" long trailing edge shall be installed in all 90 elbows.**
- F. Sheet metal ducts shall be properly braced and reinforced with galvanized steel angles or other structural members, and where they protrude above roof, they shall be properly flashed. Internal ends of all clip joints shall be installed in direction of flow.

2.2 ACCESS DOORS:

- A. As indicated on the drawings and as required by code, for proper access to dampers, filter access space, etc., provide and install sheet metal access doors of the size as noted or as required for proper access to the equipment.

2.3 AIR INLETS AND OUTLETS:

- A. Furnish and install all diffusers, registers, and grilles shown and specified on the drawings. All units to have opposed blade balancing dampers. 22 ga. steel construction with white finish unless special finish is requested. Perforated-face supply diffusers are not allowed. Approved manufacturers are Nailor, Krueger, or Carnes.

2.4 MANUAL VOLUME DAMPERS:

- A. Dampers in ducts up to 16"/16" may be single blade butterfly type. Larger dampers are to be opposed blade, airfoil type. Nailor Series 1400 or equal by Krueger, Greenheck or Titus.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Verify that the work of this section may be installed in accordance with all pertinent Codes, regulations, and plans & specifications.

END OF SECTION 233113

SECTION 233416 - HEATING/COOLING/VENTILATING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Specification Sections, apply to this Section.

1.2 SCOPE:

- A. The installation covers the furnishing and installing of cooling, heating, and exhaust systems, and all necessary trim and specialties, etc., as specified and shown on drawings and as required to provide the complete heating and cooling systems.

PART 2 - PRODUCTS

2.1 EQUIPMENT:

- A. All equipment shall be the capacity at 5000 ft. elevation and type shown on the drawings. Equipment manufacturers shall be as specified.

2.2 ROOF MOUNTED EXHAUST FANS

- A. Roof exhaust blowers shall be of the belt drive, upblast, vertical discharge type or sidewall as called for on the plans. Housing shall consist of heavy gauge aluminum construction. All spun parts shall have a rolled bead for added rigidity and shall be specially spun so as to seal the pores of the aluminum providing greater resistance against oxidation and deterioration.
- B. The fan wheel shall be all-aluminum of the centrifugal blower type featuring backward inclined blades and a tapered inlet shroud. Wheels shall be statically and dynamically balanced. Inlet cone shall be aluminum and of the centrifugal blower type. Motor and drives shall be enclosed in a weathertight compartment, separate from the exhaust airstream. Air for cooling the motor shall be supplied to the motor compartment by way of an air tube from an area free of contaminated exhaust fumes. Motors shall be of the heavy duty, permanently lubricated, sealed ball bearing type.
- C. Drives shall be sized for 165% of motor horsepower capabilities and of the cast iron type, keyed to the fan and motor shafts. Variable pitch drives shall be standard. Fan shaft shall be of steel construction, turned, ground and polished to precise tolerances in relationship to the hub and bearings. Drive belts shall be of the oil-resistant, non-static, non-sparking type with life expectancy of over 24,000 hours. Bearings shall be flanged and of the permanently lubricated, permanently sealed, ball bearing type capable of over 200,000 hours bearing life. The entire drive assembly and wheel shall be removable, as a complete unit, from the support structure without disassembling the external fan housing. The complete drive assembly shall be mounted on rubber vibration isolation. Complete with curb and back-draft damper.
- D. Units shall be of type B construction and shall carry a one-year warranty. For all belt drive units requiring type A construction, all interior and exterior parts, including wheel, wheel hub, supporting posts, fan shaft, drive assembly, and all outside fasteners shall be of aluminum or non-ferrous construction. Type A construction shall include a five-year warranty. Fans shall be licensed to bear the AMCA ratings seal for air and sound performance.
- E. Fans shall be manufactured by the Loren Cook Company, Penn Ventilator, or Greenheck.

PART 3 - EXECUTION

3.1 COORDINATION:

- A. All equipment and piping shall be arranged to allow for easy maintenance.

3.2 PROTECTION AGAINST THE ELEMENTS:

- A. The Contractor shall, at all times, take reasonable and adequate precautions to protect his work and all stored materials and equipment from damage by the elements, including flooding, windstorms, etc., and shall not expose the work of any other Contractor to such damage.

3.3 ANCHORING:

- A. All mechanical equipment shall be securely mounted. All outdoor units shall be anchored to concrete pads. Air handlers shall be anchored to the floor if floor mounted.

END OF SECTION 233416

YUBA RESTROOM DESIGN

SECTION 260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Supporting devices for electrical components.
 - 2. Electricity-metering components.
 - 3. Access Panels
 - 4. Concrete equipment bases.
 - 5. Earthwork.
 - 6. Cutting and patching for electrical construction.
 - 7. Touchup painting.
 - 8. Temporary Power and Communication
 - 9. Permits and Fees

1.3 SUBMITTALS

- A. Product Data: For electricity-metering equipment.
- B. Shop Drawings: Dimensioned plans and sections or elevation layouts of electricity-metering equipment.
- C. Submittal Procedures: Submittal procedures are specified in Division 1.
 - 1. Prepare submittals in three-ring “hard cover” binders with project name and volume on the binding. Include tabs identified by the specification section and in numerical order. Include plastic sleeves to hold drawings that exceed 8-1/2” x 11”.
 - 2. Include cover sheet with the following information: date, project name, address, and title; Installer's name, address and phone number; Project manager, and Engineering firm names and phone numbers.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70, and NFPA 99.
- C. Installer Qualifications: All workmen doing electrical work shall be duly licensed with the required supervision in the State or Locality as legally required.
 - 1. Site Review: All electricians must carry their electrician's license with them and show it upon request.

1.5 COORDINATION

YUBA RESTROOM DESIGN

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
 - 1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.
- C. Coordinate electrical equipment installation with other building components.
 - 1. Verify all dimensions be field measurements.
 - 2. Minimize costs to resolve equipment and other conflicts by successfully concluding preinstallation conferences. Include the following:
 - a. Review Divisions 21, 22 and 23 shop drawings. Compare equipment electrical specifications with equipment schedule. Prevent Div 21, 22 and 23 equipment encroaching on clearances required by NEC. Request clarification of conflicts prior to installation.
 - b. Determine whether lighting fixtures and other electrical items conflict with the location of structural members and mechanical or other equipment.
 - c. Coordinate connecting electrical service to components furnished in other sections of the specification or by the User. Verify electrical requirements including voltage, full load amps, and minimum wire ampacity prior to installing or purchasing the associated electrical equipment and wiring.
 - d. Review systems furniture electrical specifications and compare with wiring indicated. Request dimensional layout from furniture installer including electrical connection locations. Request clarification of conflicts prior to installation.
- D. Coordinate electrical service connections to components furnished by electric utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services, including provision for electricity-metering components.
 - 2. Comply with requirements of authorities having jurisdiction and of utility company providing electrical power and other services.
 - 3. Notify Architect a minimum of seven days in advance of any proposed utility interruption and obtain approval prior to proceeding. Comply with requirements of the Owner, User, and Utility.
 - 4. Include all costs, including Owner, municipal or utility costs that will need to be paid to obtain electric service.
- E. Coordinate communication service connections to components furnished by communication utility companies.
 - 1. Coordinate installation and connection of exterior underground and overhead utilities and services.
 - 2. Comply with requirements of authorities having jurisdiction.
 - 3. Notify Architect a minimum of seven days in advance of any proposed utility interruption and obtain approval prior to proceeding. Comply with requirements of the Owner, User, and Utility.
 - 4. Include all costs, including Owner, municipal or utility costs that will need to be paid to obtain communication services.
- F. Temporary Power and Communication are specified in Division 1 Section "Construction Facilities and Temporary Controls".
 - 1. Comply with requirements for temporary electric and communication services with the proper utility.
 - 2. Comply with Article 305 of the NEC.

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- G. Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces. Access doors and panels are specified in Division 8 Section "Access Doors."
- H. Coordinate with Authorities Having Jurisdiction including: city, county, state, university, federal and other governmental authorities.
 - 1. Obtain all permits (including excavation permits) prior to beginning construction.
 - 2. Pay all fees.
 - 3. Request inspections required by Authorities Having Jurisdiction in a timely manner and in order to comply with sequencing requirements.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.
 - 1. Channel Thickness: Selected to suit structural loading.
 - 2. Fittings and Accessories: Products of the same manufacturer as channel supports.
- D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- E. Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, galvanized steel, plain ends.
- F. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.
- G. Expansion Anchors: Carbon-steel wedge or sleeve type.
- H. Toggle Bolts: All-steel springhead type.
- I. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 EQUIPMENT FOR UTILITY COMPANY'S ELECTRICITY METERING

- A. Current-Transformer Cabinets: Comply with requirements of electrical power utility company.
- B. Meter Sockets: Comply with requirements of electrical power utility company.
 - 1. Housing: NEMA 250, Type 3R enclosure.

2.3 CONCRETE BASES

- A. Concrete Forms and Reinforcement Materials: As specified in Division 3 Section "Cast-in-Place Concrete."

2.4 TOUCHUP PAINT

YUBA RESTROOM DESIGN

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. For Nonequipment Surfaces: Matching type and color of undamaged, existing adjacent finish.
- C. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.
- E. Existing Utilities: Locate and identify existing underground utilities in excavation areas or in demolition areas. Maintain services to areas outside demolition limits or excavated areas. When services must be interrupted, install temporary services for affected areas.
- F. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements indicated in the Contract Documents.
- G. Record drawings and Shop Drawings: Mark up drawings daily during construction with changes or deletions in the scope of the project.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.
- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of **200-lb (90-kg)** design load.

3.3 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
 - 1. Comply with NFPA 70. In addition, install supports within 12" of couplings, fittings, and boxes, with a minimum of two supports per 10 foot length of raceway. Install supports at each change of direction. Similarly support cables in cable trays or raceways as indicated; except, provide J-hooks to support cables.
 - 2. Support suspended conduit and cables independently from all other electrical or mechanical systems by attaching directly from building structure, unless prior approval in

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- writing has been obtained from the Architect after engineering calculations have been submitted.
3. Coordinate installation of supports so as not to interfere with the removal of ceiling tiles, the service of mechanical equipment, etc.
 4. Install bracing parallel to trusses, beams, joists, bridging, etc.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Support parallel runs of cables together on trapeze or bracket type hangers, either vertically or horizontally.
- E. Size supports for multiple raceway and cable installations so capacity can be increased by a 25 percent minimum in the future.
- F. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- G. Install ~~1/4-inch-~~ (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.
- H. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- I. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- J. Simultaneously install vertical conductor supports with conductors.
- K. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If supported directly from the building structure, attach box to framing on opposite sides of the box. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than ~~24 inches~~ (610 mm) from the box.
- L. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- M. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.
1. Install wrapped or coated RMC sleeves with 3 feet extending on each side through penetrations of foundations or concrete walls by RNC.
- N. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
1. Wood: Fasten with wood screws or screw-type nails.

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2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
3. New Concrete: Concrete inserts with machine screws and bolts.
4. Existing Concrete: Expansion bolts. Drill holes in concrete so holes do not cut main reinforcing bars. Fill and seal holes drilled in concrete and not used.
 - a. Obtain prior approval from project structural engineer prior to drilling prestressed or post-tension concrete slabs and beams.
5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
8. Light Steel: Sheet-metal screws.
9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load. Do not support electrical equipment or conduits with toggle bolts, moly-bolts, or screws in sheetrock or plaster. Do not support electrical equipment or conduit from tie wires.
10. Do not use wooden plugs in concrete or masonry units for fastening conduits, tubing, boxes, cabinets, etc.

3.4 UTILITY COMPANY ELECTRICITY-METERING EQUIPMENT

- A. Install equipment according to utility company's written requirements. Provide grounding and empty conduits as required by utility company.

3.5 OWNER SUPPLIED ELECTRICITY-METERING EQUIPMENT

- A. Install equipment according to manufacturer's written requirements. Provide grounding and empty conduits as required by manufacturer's written instructions.
- B. Permanently mark multiplying factor on meter face where current transformers are used.

3.6 ACCESS DOORS

- A. Install access panels where required by accessibility requirements of NEC for electrical installations such as junction boxes, ballasts, and other electrical equipment requiring access.

3.7 FIRESTOPPING

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified in Division 7 Section "Firestopping."
- B. Gypsum Board Tenting: Apply to lighting fixture or electrical equipment penetrations of fire rated floor, ceiling and wall assemblies, unless product is UL listed with integral fire rating. Perform tenting as specified in appropriate Division 9 section to reestablish the original fire-resistance rating of the assembly at the penetration.

3.8 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated for all floor mounted electrical equipment, but not less than 4 inches (100 mm) larger, in both directions, than supported unit and 3" above floor, unless indicated otherwise. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise

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indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

1. For equipment containing hazardous liquids, such as generators, oil-filled transformers, and similar equipment, include containment curb sized for quantity of liquid.

3.9 EARTHWORK

- A. Excavating, filling, and grading: As specified in Division 31 Section "Earthwork."
- B. Fill: Backfill for underground raceways (not concrete encased) in roadways or parking lots with concrete encased slurry (1 bag mix). Backfill underground raceway (not concrete encased with sand 6" above and below in other than roadways or parking lots.
- C. Remove rubbish, waste, and excess soils.

3.10 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
 1. Core drilling: X-Ray post-tension slabs prior to core drilling to assure that post-tension cables are not damaged.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.11 FIELD QUALITY CONTROL

- A. Inspect installed components for damage and faulty work, including the following:
 1. Supporting devices for electrical components.
 2. Electricity-metering components.
 3. Concrete bases.
 4. Electrical demolition.
 5. Cutting and patching for electrical construction.
 6. Touchup painting.
- B. Test all electrical work to ensure that they test free of mechanical and electrical defects.
 1. Comply with testing requirements of authorities having jurisdiction.
 2. Comply with Owner's standards for testing in documents listed in "Quality Assurance".

3.12 REFINISHING AND TOUCHUP PAINTING

- A. Refinish and touch up paint. Paint materials and application requirements are specified in Division 9 Section "Painting."
 1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
 2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
 3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.13 CLEANING AND PROTECTION

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- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
 - 1. Remove labels that are not permanent labels.
 - 2. Wipe surfaces of electrical equipment. Remove excess lubrication and other substances.
 - 3. Clean exposed exterior and interior hard-surface finishes to a dust-free condition, free of stains, films and similar foreign substances.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.
- B. Related Sections include the following:
 - 1. Division 26 Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
 - 2. Division 26 Section "Undercarpet Electrical Power Cables" for flat cables for undercarpet installations.
 - 3. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

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1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alcan Products Corporation; Alcan Cable Division.
 - 2. American Insulated Wire Corp.; a Leviton Company.
 - 3. General Cable Corporation.
 - 4. Senator Wire & Cable Company.
 - 5. Southwire Company.
- C. Copper Conductors: Comply with NEMA WC 70.
- D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- E. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Hubbell Power Systems, Inc.
 - 3. O-Z/Gedney; EGS Electrical Group LLC.
 - 4. 3M; Electrical Products Division.
 - 5. Tyco Electronics Corp.
- C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

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- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. Calpico, Inc.
 - 3. Metraflex Co.
 - 4. Pipeline Seal and Insulator, Inc.
- D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Plastic. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: [Copper] [Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger]. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: [Type THHN-THWN, single conductors in raceway] [Type XHHW, single conductors in raceway] [Mineral-insulated, metal-sheathed cable, Type MI] [Type SE or USE multiconductor cable].
- B. Exposed Feeders: [Type THHN-THWN, single conductors in raceway] [Armored cable, Type AC] [Metal-clad cable, Type MC] [Mineral-insulated, metal-sheathed cable, Type MI] [Nonmetallic-sheathed cable, Type NM].
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: [Type THHN-THWN, single conductors in raceway] [Armored cable, Type AC] [Metal-clad cable, Type MC] [Mineral-insulated, metal-sheathed cable, Type MI] [Nonmetallic-sheathed cable, Type NM].
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

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- E. Feeders Installed below Raised Flooring: Type THHN-THWN, single conductors in raceway [Mineral-insulated, metal-sheathed cable, Type MI].
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least **[6 inches (150 mm)] [12 inches (300 mm)]** of slack.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 2. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both wall surfaces.
- G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.
- M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.
- 3.6 SLEEVE-SEAL INSTALLATION
- A. Install to seal underground exterior-wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.
- 3.7 FIRESTOPPING
- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment
 1. Overhead-lines grounding.
 2. Underground distribution grounding.
 3. Common ground bonding with lightning protection system.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:
 1. Test wells.
 2. Ground rods.
 3. Ground rings.
 4. Grounding arrangements and connections for separately derived systems.
 5. Grounding for sensitive electronic equipment.
- C. Qualification Data: For testing agency and testing agency's field supervisor.
- D. Field quality-control test reports.
- E. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:
 1. Instructions for periodic testing and inspection of grounding features at test wells ground rings based on NETA MTS NFPA 70B.
 - a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
 - b. Include recommended testing intervals.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

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- C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: **[Copper]** **[or]** **[tinned-copper]** wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, **1/4 inch (6 mm)** in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; **1-5/8 inches (41 mm)** wide and **1/16 inch (1.6 mm)** thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; **1-5/8 inches (41 mm)** wide and **1/16 inch (1.6 mm)** thick.
- C. Bare Grounding Conductor and Conductor Protector for Wood Poles:
 - 1. No. 4 AWG minimum, soft-drawn copper.
 - 2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir or cypress or cedar.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; **3/4 inch by 10 feet (19 mm by 3 m)** in diameter.
- B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.
 - 1. Termination: Factory-attached No. 4/0 AWG bare conductor at least **48 inches (1200 mm)** long.
 - 2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

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- B. Underground Grounding Conductors: Install barecopper conductor, No. 2/0 AWG minimum.
 - 1. Bury at least 24 inches (600 mm) below grade.
 - 2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.
- D. Pad-Mounted Transformers and Switches: Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

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1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.

- C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are **2 inches (50 mm)** below finished floor or final grade, unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Underground Ducts and Raceways for Electrical Systems," and shall be at least **12 inches (300 mm)** deep, with cover.
1. Test Wells: Install at least one test well for each service, unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.

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3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install [tinned] bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.
- I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet (6 m) of bare copper conductor not smaller than No. 4 AWG.
 1. If concrete foundation is less than 20 feet (6 m) long, coil excess conductor within base of foundation.
 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:
- C. Perform the following tests and inspections and prepare test reports:
 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- D. Report measured ground resistances that exceed the following values:
 1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
 2. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
 3. Substations and Pad-Mounted Equipment: 5 ohms.
- E. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

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SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Division 26 Section "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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1. AFC Cable Systems, Inc.
 2. Alfalex Inc.
 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
 5. Electri-Flex Co.
 6. Manhattan/CDT/Cole-Flex.
 7. Maverick Tube Corporation.
 8. O-Z Gedney; a unit of General Signal.
 9. Wheatland Tube Company.
- C. Rigid Steel Conduit: ANSI C80.1.
- D. Aluminum Rigid Conduit: ANSI C80.5.
- E. IMC: ANSI C80.6.
- F. PVC-Coated Steel Conduit: PVC-coated **[rigid steel conduit]** **[IMC]**.
1. Comply with NEMA RN 1.
 2. Coating Thickness: **0.040 inch (1 mm)**, minimum.
- G. EMT: ANSI C80.3.
- H. FMC: **[Zinc-coated steel][Aluminum][Zinc-coated steel or aluminum]**.
- I. LFMC: Flexible steel conduit with PVC jacket.
- J. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
 2. Fittings for EMT: **[Steel] [Die-cast] [Steel or die-cast], [set-screw] [compression] [set-screw or compression]** type.
 3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, **0.040 inch (1 mm)**, with overlapping sleeves protecting threaded joints.
- K. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2 NONMETALLIC CONDUIT AND TUBING

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 3. Arnco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corp.; Pipe & Plastics Group.
 6. Condux International, Inc.
 7. ElecSYS, Inc.
 8. Electri-Flex Co.
 9. Lamson & Sessions; Carlon Electrical Products.

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10. Manhattan/CDT/Cole-Flex.
11. RACO; a Hubbell Company.
12. Thomas & Betts Corporation.
13. **<Insert manufacturer's name.>**

- C. ENT: NEMA TC 13.
- D. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- E. LFNC: UL 1660.
- F. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- G. Fittings for LFNC: UL 514B.

2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Arnco Corporation.
 2. Endot Industries Inc.
 3. IPEX Inc.
 4. Lamson & Sessions; Carlon Electrical Products.
- C. Description: Comply with UL 2024; flexible type, approved for general-use installation.

2.4 METAL WIREWAYS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
 2. Hoffman.
 3. Square D; Schneider Electric.
- C. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type [1] [12] [3R], unless otherwise indicated.
- D. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- E. Wireway Covers: [Hinged type] [Screw-cover type] [Flanged-and-gasketed type] [As indicated].
- F. Finish: Manufacturer's standard enamel finish.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

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- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
 2. EGS/Appleton Electric.
 3. Erickson Electrical Equipment Company.
 4. Hoffman.
 5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
 6. O-Z/Gedney; a unit of General Signal.
 7. RACO; a Hubbell Company.
 8. Robroy Industries, Inc.; Enclosure Division.
 9. Scott Fetzer Co.; Adalet Division.
 10. Spring City Electrical Manufacturing Company.
 11. Thomas & Betts Corporation.
 12. Walker Systems, Inc.; Wiremold Company (The).
 13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.
 14. **<Insert manufacturer's name.>**
- C. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- D. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- F. Metal Floor Boxes: [Cast metal] [Sheet metal] [Cast or sheet metal], [fully adjustable] [semi-adjustable], rectangular.
- G. Nonmetallic Floor Boxes: Nonadjustable, round.
- H. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- I. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- J. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- K. Cabinets:
1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 2. Hinged door in front cover with flush latch and concealed hinge.
 3. Key latch to match panelboards.
 4. Metal barriers to separate wiring of different systems and voltage.
 5. Accessory feet where required for freestanding equipment.

2.6 SLEEVES FOR RACEWAYS

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

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- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.7 SLEEVE SEALS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide a product by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. Calpico, Inc.
 - 3. Metraflex Co.
 - 4. Pipeline Seal and Insulator, Inc.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Exposed Conduit: Rigid steel conduit.
 - 2. Concealed Conduit, Aboveground: EMT.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type [3R] [4].
- B. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 - 5. Damp or Wet Locations: Rigid steel conduit.
 - 6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.
- E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.
- F. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least **6 inches (150 mm)** away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."
- E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- H. Raceways Embedded in Slabs:
 - 1. Run conduit larger than **1-inch (27-mm)** trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
 - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
 - 3. Change from ENT to RNC, Type EPC-40-PVC, rigid steel conduit, or IMC before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than **200-lb (90-kg)** tensile strength. Leave at least **12 inches (300 mm)** of slack at each end of pull wire.
- L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
 - 1. **3/4-Inch (19-mm)** Trade Size and Smaller: Install raceways in maximum lengths of **50 feet (15 m)**.
 - 2. **1-Inch (25-mm)** Trade Size and Larger: Install raceways in maximum lengths of **75 feet (23 m)**.
 - 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 2. Where otherwise required by NFPA 70.
- N. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed **30 deg F (17 deg C)**, and that has straight-run length that exceeds **25 feet (7.6 m)**.
1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: [**125 deg F (70 deg C)**] **<Insert temperature>** temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: [**155 deg F (86 deg C)**] **<Insert temperature>** temperature change.
 - c. Indoor Spaces: Connected with the Outdoors without Physical Separation: [**125 deg F (70 deg C)**] **<Insert temperature>** temperature change.
 - d. Attics: [**135 deg F (75 deg C)**] **<Insert temperature>** temperature change.
 - e. **<Insert location and corresponding temperature change.>**
 2. Install fitting(s) that provide expansion and contraction for at least **0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C)** of temperature change.
 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- O. Flexible Conduit Connections: Use maximum of **72 inches (1830 mm)** of flexible conduit for **[recessed and semirecessed lighting fixtures,]** equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
1. Use LFMC in damp or wet locations subject to severe physical damage.
 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- P. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.
- Q. Set metal floor boxes level and flush with finished floor surface.
- R. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Division 31 Section "Earth Moving" for pipe less than **6 inches (150 mm)** in nominal diameter.
 2. Install backfill as specified in Division 31 Section "Earth Moving."
 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within **12 inches (300 mm)** of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving."
 4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
 5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

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- a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with **3 inches (75 mm)** of concrete.
- b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of **60 inches (1500 mm)** from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.
6. Warning Planks: Bury warning planks approximately **12 inches (300 mm)** above direct-buried conduits, placing them **24 inches (600 mm)** o.c. Align planks along the width and along the centerline of conduit.

3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

- A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.
- B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from **1/2-inch (12.5-mm)** sieve to **No. 4 (4.75-mm)** sieve and compacted to same density as adjacent undisturbed earth.
- C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures **1 inch (25 mm)** above finished grade.
- D. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.
- E. Field-cut openings for conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Rectangular Sleeve Minimum Metal Thickness:
 1. For sleeve cross-section rectangle perimeter less than **50 inches (1270 mm)** and no side greater than **16 inches (400 mm)**, thickness shall be **0.052 inch (1.3 mm)**.
 2. For sleeve cross-section rectangle perimeter equal to, or greater than, **50 inches (1270 mm)** and 1 or more sides equal to, or greater than, **16 inches (400 mm)**, thickness shall be **0.138 inch (3.5 mm)**.
- E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- F. Cut sleeves to length for mounting flush with both surfaces of walls.
- G. Extend sleeves installed in floors **2 inches (50 mm)** above finished floor level.

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- H. Size pipe sleeves to provide **1/4-inch (6.4-mm)** annular clear space between sleeve and raceway unless sleeve seal is to be installed.
- I. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint. Refer to Division 07 Section "Joint Sealants" for materials and installation.
- K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07 Section "Penetration Firestopping."
- L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.
- M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for **1-inch (25-mm)** annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for **1-inch (25-mm)** annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

- A. Install to seal underground, exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

3.8 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

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SECTION 260553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes electrical identification materials and devices required to comply with ANSI C2, NFPA 70, OSHA standards, and authorities having jurisdiction.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Schedule of Nomenclature: An index of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate color, lettering style, and graphic features of identification products.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI C2.
- B. Comply with NFPA 70.
- C. Comply with ANSI A13.1 and NFPA 70 for color-coding.

PART 2 - PRODUCTS

2.1 RACEWAY, CABLE AND WIRING DEVICE LABELS

- A. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear, weather- and chemical-resistant coating.
- B. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide (0.08 mm thick by 25 to 51 mm wide).
- C. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.
 - 1. Not less than 6 inches wide by 4 mils thick (152 mm wide by 0.102 mm thick).
 - 2. Compounded for permanent direct-burial service.
 - 3. Embedded continuous metallic strip or core.
 - 4. Printed legend indicating type of underground line.
- D. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

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2.2 NAMEPLATES AND SIGNS

- A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.
- B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. in. (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
- C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for the application. 1/4-inch (6.4-mm) grommets in corners for mounting.
- D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch (6.4-mm) grommets in corners for mounting.
- E. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.3 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch (5 mm).
 - 2. Tensile Strength: 50 lb (22.3 kg) minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
 - 4. Color: According to color-coding.
- B. Paint: Formulated for the type of surface and intended use.
 - 1. Primer for Galvanized Metal: Single-component acrylic vehicle formulated for galvanized surfaces.
 - 2. Primer for Concrete Masonry Units: Heavy-duty-resin block filler.
 - 3. Primer for Concrete: Clear, alkali-resistant, binder-type sealer.
 - 4. Enamel: Silicone-alkyd or alkyd urethane as recommended by primer manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract Documents or with those required by codes and standards. Use consistent designations throughout Project.
- C. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before applying.
- E. Install painted identification according to manufacturer's written instructions and as follows:
 - 1. Clean surfaces of dust, loose material, and oily films before painting.

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2. Prime surfaces using type of primer specified for surface.
 3. Apply one intermediate and one finish coat of enamel.
- F. Paint fire alarm junction boxes red.
1. Apply the following colors to the systems listed below:
 - a. Fire Alarm System: Red.
 - b. Nurse Call System: Green.
 - c. CCTV, Access Control and Intrusion Detection Systems: Blue.
 - d. Paging System: Yellow
 - e. Television Distribution System: Black
 - f. Structured Cabling System: Orange
- G. Caution Labels for Indoor Boxes and Enclosures for Power and Lighting: Install pressure-sensitive, self-adhesive labels identifying system voltage with black letters on orange background. Install on exterior of door or cover.
- H. Circuit Identification Labels on Boxes: Install labels externally for all installed boxes prior to installation of conductors.
1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
 2. Concealed Boxes: Plasticized card-stock tags.
 3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- I. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.
- J. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches (400 mm) overall, use a single line marker. Install line marker for underground wiring, both direct buried cables and cables in raceway.
- K. Color-Coding of Secondary Phase Conductors: Color code switch legs, travelers and other wiring for branch circuits other than those listed below. Use the following colors for service, feeder and branch-circuit phase conductors:
1. 120v Isolated Power Systems
 - a. No. 1 Conductor: Orange.
 - b. No. 2 Conductor: Brown.
 - c. Ground: Green.
 2. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 6 AWG:
 - a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch- (25-mm-) wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
- L. Power-Circuit Identification: Metal tags or aluminum, wraparound marker bands for cables, feeders, and power circuits in vaults, pull and junction boxes, manholes, and switchboard rooms.
1. Legend: 1/4-inch- (6.4-mm-) steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
 2. Tag Fasteners: Nylon cable ties.
 3. Band Fasteners: Integral ears.

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- M. Apply identification to conductors as follows:
1. Conductors to Be Extended in the Future: Indicate source and circuit numbers.
 2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
 3. Multiple Control and Communication Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.
 4. Identify concrete encased feeders over 600 V with red dye.
- N. Apply warning, caution, and instruction signs as follows:
1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
- O. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high lettering on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high. Use white lettering on black field. Refer to labeling schedule for lettering and background colors for specialized labeling. Apply labels for each unit of the following categories of equipment using mechanical fasteners:
1. Interior and exterior of panelboards, electrical cabinets, and enclosures.
 - a. Distribution Panelboards: Identify Distribution Panelboard designation and circuit serving distribution panelboard; label main and distribution overcurrent protection showing load served and location (identify room numbers).
 - b. Branch Panelboards: Identify distribution panel and circuit serving panelboard.
 - c. Main Overcurrent Protection: Identify main device and service disconnects.
 2. Access doors and panels for concealed electrical items.
 3. Disconnect switches.
 - a. Identify equipment designation, fla.
 4. Enclosed circuit breakers.
 5. Motor starters.
 - a. Identify equipment designation, horsepower of fan, fla, and heater size.
- P. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual

END OF SECTION 260553

YUBA RESTROOM DESIGN

SECTION 262416

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes load centers and panelboards, overcurrent protective devices, and associated auxiliary equipment rated 600 V and less for the following types:
 - 1. Lighting and appliance branch-circuit panelboards.
- B. Related Sections include the following:
 - 1. Division 26 Section "Fuses."
 - 2. Division 26 Section "Seismic Controls for Electrical Systems."
 - 3. Division 26 Section "Transient Voltage Surge Suppression for Low-Voltage Electrical Power Circuits."

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. RFI: Radio-frequency interference.
- D. RMS: Root mean square.
- E. SPDT: Single pole, double throw.
- F. TVSS: Transient voltage surge suppressor.

1.4 SUBMITTALS

- A. Product Data: For each type of panelboard, overcurrent protective device, TVSS device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Bus configuration, current, and voltage ratings.
 - c. Short-circuit current rating of panelboards and overcurrent protective devices.
 - d. Layout of overcurrent devices in panelboard.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

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2. Wiring Diagrams: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Manufacturer Seismic Qualification Certification: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Division 26 Section "Seismic Controls for Electrical Systems." Include the following:
 1. Basis of Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 2. The term "withstand" means "the unit will remain in place without separation of internal and external parts during a seismic event and the unit will be fully operational after the event."
 3. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 4. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- D. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.
- E. Field Test Reports: Submit written test reports and include the following:
 1. Test procedures used.
 2. Test results that comply with requirements.
 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- F. Maintenance Data: For panelboards and components to include in maintenance manuals specified in Division 1. In addition to requirements specified in Division 1 Section "Contract Closeout," include the following:
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Testing agency that is a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.
 1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.

1.6 COORDINATION

YUBA RESTROOM DESIGN

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, and encumbrances to workspace clearance requirements.

1.7 EXTRA MATERIALS

- A. Keys: Six spares of each type of panelboard cabinet lock.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Panelboards, Overcurrent Protective Devices, Controllers, Contactors, and Accessories:
 - a. Eaton Corp.; Cutler-Hammer Products.
 - b. General Electric Co.; Electrical Distribution & Control Div.
 - c. Siemens Energy & Automation, Inc.
 - d. Square D Co.
 - e. Isotrol (Isolated Power Panels using equipment by manufacturer that supplies the other panels).

2.2 FABRICATION AND FEATURES

- A. Enclosures: Flush- and surface-mounted cabinets as indicated on the drawings. NEMA PB 1, Type 1, to meet environmental conditions at installed location.
 - 1. Kitchen Areas: NEMA 250, Type 4X, stainless steel.
 - 2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
- B. Finish: Manufacturer's standard enamel finish over corrosion-resistant treatment or primer coat.
 - 1. Isolated Power System Panelboards: Stainless Steel Covers.
- C. Directory Card: With transparent protective cover, mounted inside metal frame, inside panelboard door.
- D. Bus: Tin-plated aluminum.
- E. Main and Neutral Lugs: Mechanical type suitable for use with conductor material.
- F. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment ground conductors; bonded to box.
- G. Insulated Equipment Ground Bus: Adequate for feeder and branch-circuit equipment insulated ground conductors; insulate from box.
- H. Service Equipment Label: UL labeled for use as service equipment for panelboards with main service disconnect switches.
- I. Future Devices: Mounting brackets, bus connections, and necessary appurtenances required for future installation of devices.
- J. Isolated Equipment Ground Bus: Adequate for branch-circuit equipment ground conductors; insulated from box.

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- K. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads as indicated on drawings.
- L. Feed-through Lugs: Mechanical type suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

2.3 PANELBOARD SHORT-CIRCUIT RATING

- A. 30,000 amps SCC

2.4 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- B. Doors: Front mounted with concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.5 ELEVATOR SHUNT-TRIP FUSED DISTRIBUTION PANELBOARDS (Power Module Panels)

- A. Ratings:
 - 1. Panelboards shall have a voltage and current rating as indicated on the drawings.
 - 2. Panelboard assemblies switches with shunt trip, control wiring and accessories shall have a short-circuit current rating of 200,000A rms symmetrical at the voltage indicated on the drawings.
 - 3. Series ratings are not permitted.
- B. Selective Coordination:
 - 1. Feeders for multiple elevator installations shall be selectively coordinated with the upstream feeder circuit breaker in accordance with NEC 620.62.
- C. Construction
 - 1. Box shall be Type 1 alvanized steel with interior mounting studs as standard. Trim shall be Type 1 dead-front, surface mount standard
 - 2. Interiors shall be factory assembled
 - 3. Main bus shall be plated copper sized in accordance with UL 67 heat-rise tests.
 - 4. Main bus shall be fully rated at the ampacity indicated on drawings.
 - 5. Fully rated solid neutral bus shall be provided for panelboards with neutral.
 - 6. Solidly bonded copper equipment ground bar shall be provided.
- D. Main Device
 - 1. Provide main lugs only.
- E. Branch Devices
 - 1. Provide shunt-trip fused distribution panel with fused disconnect switches with shunt-trip and an accessory control enclosure with all necessary relay(s), control transformer and other options for each shunt-trip fused disconnect switch, as shown on drawings and listed below:
 - a. Ampere rating of the switch shall be based upon the elevator manufacturer requirements for Class J fuses.
 - b. Short-circuit current rating of 200,000A with Class J fuses.
 - c. Interlocks to prevent the opening of the cover when the switch is in the ON position. Interlock shall be defeatable for testing purposes.

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- d. Handle lockable in OFF position.
- F. Accessory Control Enclosure (contains accessories for each shunt-trip fused disconnect switch):
 - 1. 100VA control power transformer with primary and secondary fuses. The primary voltage rating shall be 480 volts with a 120V secondary.
 - 2. Isolation relay (3PDT, 10amp, 120V). The coil of the isolation relay shall be 24V DC. A normally open dry contact shall be provided by the Fire Alarm Safety System to energize the isolation relay and activate the shunt trip solenoid (140VA inrush at 120V). A separate 24V DC source and contact must be provided by the Fire Alarm Safety System.
 - 3. Provide additional options as indicated below:
 - a. Key to Test Switch.
 - b. Red "On" Pilot Light.
 - c. 1P NC Mechanical Interlock.
 - d. Fire Alarm Voltage Monitoring Relay (Comply with NFPA 72)

PART 3 - EXECUTION

3.1 APPLICATION

- A. Examine areas where panelboards are planned to be installed. Coordinate with other installers so that installation complies with NEC 110-26.
 - 1. Do not locate panelboards so that the door swing swings through the clear area.

3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Prior to installing isolated power panels review the installation with the technician that will be performing the factory testing. Submit a letter of approval from the technician stating that the proposed installation is in conformance with the installation requirements for the isolated power panel.
- C. Comply with mounting and anchoring requirements specified in Division 26 Section "Seismic Controls for Electrical Systems."
- D. Mounting Heights: Top of trim 84 inches (1880 mm) above finished floor, unless otherwise indicated. In no case shall the handle for the highest circuit breaker be located more than 78" above the finished floor.
- E. Mounting: Plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish.
- F. Circuit Directory: Create a directory to indicate installed circuit loads showing locations (final room numbers as determined by user) and use. Obtain approval for room numbers to be used before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- G. Install filler plates in unused spaces.
- H. Provision for Future Circuits at Flush Panelboards: Unless indicated otherwise stub six 1-inch empty conduits from each panelboard section into accessible ceiling space or space designated to be ceiling space in the future. Stub five 1-inch empty conduits into raised floor space or below slab not on grade.

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- I. Wiring in Panelboard Gutters: Arrange conductors into groups and bundle and wrap with wire ties after.
- J. Snow-Melting Equipment: Provide circuit breakers with integral ground-fault protection of equipment for all circuits that are used to supply fixed outdoor deicing and snow-melting equipment.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in Division 26 Section "Identification for Electrical Systems."
- B. Panelboard Nameplates: Label each panelboard with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.

3.4 CONNECTIONS

- A. Install equipment grounding connections for panelboards with ground continuity to main electrical ground bus.
- B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.5 FIELD QUALITY CONTROL

- A. Prepare for acceptance tests as follows:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Testing: After installing panelboards and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 - 1. Procedures: Perform each visual and mechanical inspection and electrical test indicated in NETA ATS, Section 7.5 for switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.6 CLEANING

- A. On completion of installation, inspect interior and exterior of panelboards. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 262416

YUBA RESTROOM DESIGN

SECTION 262726

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Single and duplex receptacles, ground-fault circuit interrupters, and isolated-ground receptacles.
 - 2. Single- and double-pole snap switches and dimmer switches.
 - 3. Device wall plates.
 - 4. Special purpose receptacles.
 - 5. Floor service outlets, poke-through assemblies, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Wiring Devices:
 - a. Bryant Electric, Inc./Hubbell Subsidiary.
 - b. Eagle Electric Manufacturing Co., Inc.
 - c. Hubbell Incorporated; Wiring Device-Kellems.
 - d. Leviton Mfg. Company Inc.
 - e. Pass & Seymour/Legrand; Wiring Devices Div.
 - 2. Poke-Through and Floor Service Outlets.:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Pass & Seymour/Legrand; Wiring Devices Div.
 - c. Square D/Groupe Schneider NA.
 - d. Thomas & Betts Corporation.
 - e. Wiremold Company (The).
 - 3. Dimming Switches:
 - a. Hubbell Incorporated; Wiring Device-Kellems.
 - b. Leviton Lighting Controls
 - c. Lightolier Controls
 - d. Lutron Electronics, Inc.

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
 - 1. Thermoplastic face.
 - 2. Thermoset base.
 - 3. Back and side wired.
 - 4. Rating: 20 A minimum
- B. Straight-Blade (30 A thru 50A) and Locking Receptacles: Heavy -Duty grade.
- C. Hospital Grade Straight-Blade Receptacles: Comply with NEMA WD 1, NEMA WD 6, DSCC W-C-596G, and UL 498.
 - 1. Thermoplastic face.
 - 2. Thermoset base.
 - 3. Back and side wired.
 - 4. Rating: 20 A minimum.
- D. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

2.3 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
 - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

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2.4 SWITCHES

- A. Single- and Double-Pole Switches: Comply with DSCC W-C-896F and UL 20.
 - 1. Rating: Minimum 20A.
 - 2. Thermoplastic face.
 - 3. Thermoset base.
 - 4. Back and side wired.
 - 5. Locking type as referenced on the drawings
 - 6. Lighted handle as referenced on the drawings.
 - 7. Pilot Light as referenced on the drawings.

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish, except screwless devices for locations where only dimmers are shown.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic
 - 3. Material for Operating Rooms and Kitchens: 0.035-inch- (1-mm-) thick, satin-finished stainless steel.
 - 4. Material for Unfinished Spaces: Galvanized steel.
 - 5. Material for Wet Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' written instructions.
- C. Install control wiring for electronic fluorescent dimmers (low voltage or line voltage) per manufacturers written instructions.
- D. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- E. Wallplates and coverplates: install wallplates and coverplates for all outlets, including blank outlets.
- F. GFI Devices: Install separate GFCI devices, except where installed under the same multi-gang plate.
- G. Remove wall plates and protect devices and assemblies during painting.
- H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- I. Install cord and plug sets for appliances, mechanical equipment, and other equipment per manufacturer's written instructions.

3.2 CONNECTIONS

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- A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare written test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
 - 3. Check the resistance between the ground point of each receptacle and the reference point, and it shall be less than 0.1 ohms. The voltage potential difference between any exposed conductive surfaces in the patient vicinity shall be checked, the difference to be no more than 40 millivolts. These tests are required by NFPA No. 99 for new construction areas.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

Rocker Style Wiring Device Schedule

Note to Bidders: Comply with Section 16140 of the specifications. The catalog numbers listed below have been carefully prepared with the assistance of the manufacturer's representatives with the objective of assisting the bidders in determining the quality and ratings of the wiring device specified; however, the catalog numbers may not be complete or accurate. In addition, the color of the wiring device is not intended to be determined by the catalog numbers listed below, but shall be selected by the Architect as indicated in the specification. Each manufacturer prior to bidding shall compare catalog numbers shown with the description and shall notify the Architect/Engineer of any discrepancies.

NEMA	DESCRIPTION	CATALOG NUMBERS
20A Single Pole	20A single pole 125V-277V standard rocker switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan decorator face, back and side wired. Rated 1 HP 120V.	Hubbell HBL2121 Leviton 5621 P & S 2621 Bryant 9901

Standard Wiring Device Schedule		
Note to Bidders: Comply with Section 16140 of the specifications. The catalog numbers listed below have been carefully prepared with the assistance of the manufacturer's representatives with the objective of assisting the bidders in determining the quality and ratings of the wiring device specified; however, the catalog numbers may not be complete or accurate. In addition, the color of the wiring device is not intended to be determined by the catalog numbers listed below, but shall be selected by the Architect as indicated in the specification. Each manufacturer prior to bidding shall compare catalog numbers shown with the description and shall notify the Architect/Engineer of any discrepancies.		
NEMA	DESCRIPTION	CATALOG NUMBERS
NEMA 5-20R	20A, 125V 2 pole 3 wire simplex grounding receptacles. Nylon or Lexan Faces. Back and side wired. Comply with FS W-C-596 and UL 498.	Bryant 5361 Hubbell HBL5361 Leviton 5351 P&S 5351
NEMA 5-20R	20A, 125V 2 pole 3 wire duplex grounding receptacles. Nylon or Lexan Faces. Back and side wired. Comply with FS W-C-596 and UL 498.	Bryant 5352 Hubbell CR5352 Leviton 5352 P&S 5352
NEMA 5-20R GFCI	20A, 125V 2 pole 3 wire duplex feed thru GFCI receptacles with indicator light. Nylon or Lexan decorator faces. Back and side wired. Internal components shall comply with FS W-C-596 where applicable. Comply with UL 498 and UL 493.	Bryant GFR53FT Hubbell GF5352 Leviton 6898 P&S 2094 S
NEMA 5-20R Isolated Ground	20A, 125V 2 pole 3 wire isolated ground duplex grounding receptacles. Nylon or Lexan faces. Back and side wired. Comply with FS W-C-596 and UL 498.	Bryant 5362IG Hubbell CR5352IG Leviton 5362 - IG P&S IG6300
NEMA 5-20R Waterproof (Weatherproof in use)	20A, 125V 2 pole 3 wire duplex grounding receptacles. Nylon or Lexan Faces. Back and side wired. Comply with FS W-C-596 and UL 498. Fully gasketed weatherproof while in use enclosure.	Hubbell CR5352/5051-0
NEMA 5-20R Weatherproof	20A, 125V 2 pole 3 wire duplex grounding receptacles. Nylon or Lexan Faces. Back and side wired. Comply with FS W-C-596 and UL 498. Cast aluminum and UL listed for wet locations.	Hubbell HBL5206WO
20A Single Pole	20A single pole 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1221 Leviton 1221 P & S 521 Bryant 4901
20A Three-way	20A three-way 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1223 Leviton 1223 P & S 523 Bryant 4903
20A Four-way	20A four-way 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 1 HP 120V.	Hubbell CS1224 Leviton 1224 P & S 524 Bryant 4904

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20A Double Pole	20A double pole 125V-277V standard toggle switch labeled as complying UL standard 20 and with Federal Specification W-S-896. Provide Nylon or Lexan face, back and side wired. Rated 2 HP 240V. Double pole.	Hubbell CS1222 Leviton 1222 P & S 522 Bryant 4902
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END OF SECTION 262726

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SECTION 265100

INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior lighting fixtures with lamps and ballasts.
 - 2. Lighting fixtures mounted on exterior building surfaces.
- B. Related Sections include the following:
 - 1. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.3 DEFINITIONS

- A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.
- B. CRI: Color rendering index.
- C. CU: Coefficient of utilization.
- D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:
 - 1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.
- E. RCR: Room cavity ratio.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of fixture, including dimensions and verification of indicated parameters.
 - 2. Emergency lighting unit battery and charger.
 - 3. Fluorescent and high-intensity-discharge ballasts.
 - 4. Lamps.
- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Wiring Diagrams: Power, signal, and control wiring.
- D. Product Certificates: For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.

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- E. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:
 - 1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.
- F. Warranties: Special warranties specified in this Section.
- G. Spare Parts: include spare parts materials and quantity.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 1. Test products to UL standards by nationally recognized testing laboratory, where an appropriate standard exists.
- B. Comply with NFPA 70.
- C. FMG Compliance: Fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.
- D. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.
- E. Mockups: Provide lighting fixtures for room or module mockups. Install fixtures for mockups with power and control connections.
 - 1. Obtain Architect's approval of fixtures for mockups before starting installations.
 - 2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7 WARRANTY

- A. Special Warranty for Emergency Lighting Unit Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
- B. Special Warranty for Fluorescent Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
 - 2. Warranty Period for Electromagnetic Ballasts: Three years from date of Substantial Completion.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified.
- B. Interior Transformers for Low Voltage Lighting.
 - 1. Q-Tran

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
 - 1. Equip recessed fixtures with six foot flexible conduit whips for connection to external j-boxes, except that junction boxes may integral for prewired framing kits for incandescent and PL fluorescent downlights.
- B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
- C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 92 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- I. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is scheduled.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass, unless otherwise indicated.
- J. Electromagnetic-Interference Filters: A component of fixture assembly. Suppress conducted electromagnetic-interference as required by MIL-STD-461D. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

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- K. Air-Handling Fluorescent Fixtures: For use with plenum ceiling for heat extraction.
 - 1. Heat Removal Units: Air path leads through lamp cavity.

2.3 LIGHTING FIXTURES

- A. Fixtures: Refer to Lighting Fixture Schedule on the drawings.

2.4 FLUORESCENT LAMP BALLASTS

- A. Description: Include the following features, unless otherwise indicated:
 - 1. Designed for type and quantity of lamps indicated at full light output, unless 1.2 BF is specified except for emergency lamps powered by in-fixture battery-packs.
 - a. Linear Electronic Ballasts: full light output is defined as .88 BF.
 - b. Linear Magnetic Ballasts: full light output is defined as .95 BF.
 - c. Compact Fluorescent Ballasts: full light output is defined as 1.0 BF.
 - 2. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
- B. Electronic ballasts (nondimming) for linear lamps shall include the following features, unless otherwise indicated:
 - 1. Comply with NEMA C82.11.
 - 2. Ballast Type: Programmed start with two-step lamp starting to extend life of frequently started lamps; if not available from any manufacturer, provide rapid start.
 - 3. Sound Rating: A.
 - 4. Total harmonic distortion rating of less than 20 percent according to NEMA C82.11.
 - 5. Transient Voltage Protection: IEEE C62.41, Category A.
 - 6. Operating Frequency: 20 kHz or higher.
 - 7. Lamp Current Crest Factor: Less than 1.7.
 - 8. Parallel Lamp Circuits: Multiple lamp ballasts connected to maintain full light output on surviving lamps if one or more lamps fail.
 - 9. Provide lamp end-of-life detection and shutdown circuit for T5 diameter lamps.]
- C. Ballasts for compact fluorescent lamps in recessed fixtures shall have the following features, unless otherwise indicated:
 - 1. Type: Electronic.
 - 2. Power Factor: 90 percent, minimum.
 - 3. Flicker: Less than 5 percent.
 - 4. Lamp Current Crest Factor: Less than 1.7.
 - 5. Electronic Ballast Operating Frequency: 20 kHz or higher.
 - 6. Lamp end-of-life detection and shutdown circuit.
 - 7. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
- D. Ballasts for compact lamps in nonrecessed fixtures shall include the following features, unless otherwise indicated:
 - 1. Power Factor: 90 percent, minimum.
 - 2. Ballast Coil Temperature: 65 deg C, maximum.
 - 3. Transient Protection: Comply with IEEE C62.41 for Category A1 locations.
- E. Ballasts for dimmer-controlled fixtures shall comply with general and fixture-related requirements above for electronic ballasts and the following features:
 - 1. Dimming Range: 100 to 5 percent of rated lamp lumens, unless specifically indicated otherwise.
 - 2. Ballast Input Watts: Can be reduced from 100 to 20 percent of normal as it dims.
 - 3. Compatibility: Certified by manufacturer for use with specific dimming system indicated.

- F. Ballasts for Low-Temperature Environments:
 - 1. Temperatures 0 deg F (Minus 17 deg C) and Higher: Electronic or electromagnetic type rated for 0 deg F (Minus 17 deg C) starting temperature.
 - 2. Temperatures Minus 20 deg F (Minus 29 deg C) and Higher: Electromagnetic type designed for use with high-output lamps.

2.5 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

- A. General: Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated.
 - 1. Type: Constant-wattage autotransformer, pulse start, or regulating high-power-factor type.
 - 2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.
 - 3. Normal Ambient Operating Temperature: 104 deg F 40 deg C.
 - 4. Open-circuit operation that will not reduce average life.

2.6 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.
- C. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - 1. Self-diagnostic circuit: fully automatic testing and diagnostic circuit to cycle battery and test battery and lamps including reporting failures.

2.7 FLUORESCENT EMERGENCY LIGHTING FIXTURES

- A. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body. Comply with UL 924.
 - 1. Emergency Connection: Operate one fluorescent lamp continuously to 1100 lumens minimum. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
 - 2. Night Light Connection: Operate one fluorescent lamp continuously.
 - 3. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
 - 4. Battery: Sealed, maintenance-free, with minimum seven-year nominal life.
 - 5. Charger: Fully automatic, solid-state, constant-current type.

2.8 FLUORESCENT LAMPS

- A. Low-Mercury Lamps: Comply with Federal toxic characteristic leaching procedure (TCLP) test, and yield less than 0.2 mg of mercury per liter, when tested according to NEMA LL 1.
- B. T8 rapid-start low-mercury lamps, CRI of 82 (minimum), color temperature of 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.
- C. T5 programmed-start low-mercury lamps, CRI of 85 (minimum), color temperature of 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.

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- D. Compact Fluorescent Lamps: CRI 80 (minimum), color temperature 4100, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.

2.9 HIGH-INTENSITY-DISCHARGE LAMPS

- A. Metal-Halide Lamps: ANSI C78.1372, wattage and burning position as scheduled, CRI 65 (minimum), and color temperature 4000.

2.10 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Common Work Results for Electrical" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gage (2.68 mm).
- E. Rod Hangers: 3/16-inch- (5-mm-) minimum diameter, cadmium-plated, threaded steel rod.
- F. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.11 FINISHES

- A. Fixtures: Manufacturers' standard, unless otherwise indicated.
 - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
 - 2. Metallic Finish: Corrosion resistant.

2.12 SOURCE QUALITY CONTROL

- A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.
- B. Factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceilings and walls. Adjust trims for recessed fixtures to eliminate light leaks. Install lamps in each fixture.
 - 1. Install fixtures with the separation from combustible material as required by lighting fixture rating, per manufacturer's written instructions; in no case, install recessed fixture within 1/2" of combustible material.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
 - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

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3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel or at the intersection of four tiles, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
 4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- C. Suspended Fixture Support: As follows:
1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
 3. Industrial Fixtures, Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
 4. Extruded fixtures, Continuous Rows: Suspend from cable.
- D. Air-Handling Fixtures: Install with dampers closed and ready for adjustment.
- E. Adjust aimable fixtures to provide required light intensities.
- ### 3.2 CONNECTIONS
- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- ### 3.3 FIELD QUALITY CONTROL
- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
1. Clean transparent materials. Replace chipped or broken lenses and other damaged transparent materials.
 2. Restore reflective surfaces to their reflective conditions.
 3. Clean light fixtures and lamps.
- B. Verify normal operation of each fixture after installation.
- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
- E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION 265100

SECTION 310000 - GENERAL SITE PROJECT CONSTRUCTION

PART 1 GENERAL

- 1-1 DESCRIPTION: The scope of work for this project shall be as described in the drawings and this specification.
- 1-2.1 JOB CONDITIONS: The Contractor is to operate, construct and store materials totally within the limits of construction shown on the drawings. Operation of roadways in all areas on or adjacent to the site are to remain operational without delay or encumbrance due to this construction. The Contractor is to have use of the area within the limits of construction area shown on drawings for the duration of the contract time.

This Contractor shall be responsible for safety of his operation within the limits of construction and vehicular access points necessary to complete his work. He shall provide flagman, signs barriers, and all traffic control necessary according to all local and/or city standards.

PART 2 MATERIALS_ --NOT USED

PART 3 EXECUTION

- 3-1 DEMOLITION: The Contractor shall remove all materials designated on the drawings. This material shall be handled, hauled, and disposed of off-site by the Contractor at no additional cost to the Owner.
- 3-2 CONSTRUCTION SURVEYS: The Contractor shall provide all necessary construction surveys for all phases of construction at no additional cost to the Owner. The basis of bearing, bench mark and beginning project coordinates are shown on the drawings and shall be confirmed by the contractor at no additional cost to the Owner.
- 3-3 TESTING: All construction testing shall be arranged and paid for by the contractor
. All retesting needed to verify previously tested unsatisfactory construction shall be at contractors expense. See other sections of this specification for testing required.
- 3-4 DISPOSAL OF EXCESS AND UNSUITABLE MATERIAL: The contractor shall load, haul, and legally dispose of off-site all excess site development material and all site excavated unsuitable material. All costs associated with this work shall be included in the contracted bid price.
- 3-5 CONSTRUCTION ACTIVITY: It is expected that a relatively high water table could be present during the site development and building construction. Contractor shall include in his bid all costs associated with pumping, cofferdams, piping, power, slope stabilization and maintaining dry conditions for placing imported or embankment materials, installing utilities and any special fills shown on the drawings.
- 3-6 SOILS DATA: A copy of the site soils/geotechnical report is available upon request from the architect. Interpretation of the report is the responsibility of the contractor.

END SECTION 310000

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing site utilities.
7. Temporary erosion- and sedimentation-control measures.

1.2 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises determined by Owner within ½ mile of project site.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.
- E. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot traffic.
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Locate and clearly identify trees, shrubs, and other vegetation to remain or to be relocated.
- C. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.

- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Grind down stumps and remove roots, obstructions, and debris to a depth of **18 inches (450 mm)** below exposed subgrade.
 - 2. Use only hand methods for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of **8 inches (200 mm)**, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of **6 inches (150 mm)** in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 – EARTH MOVING

PART 1 GENERAL

1-1 DESCRIPTION OF WORK:

- A. The work of this section consists of furnishing, loading, hauling, and placing of borrow material in the construction of the building and pavement pad as shown and specified.
- B. QUALITY ASSURANCE: Reference, Unified Soil Classification System (USCS) as published by Bureau of Reclamation in the Earth Manual.
- C. JOB CONDITIONS: Shall be described on the drawings.

PART 2 MATERIALS

2-1 BORROW:

- A. General: Selected materials shall meet the requirements and conditions of the particular fill for which its use is intended. Sand soils or sand-clay soils capable of being readily shaped and compacted to the required densities may be used when approved. Material shall be free of roots, trash, and other deleterious material.
- B. Borrow shall consist of material obtained from sources provided by the Contractor and shall meet the requirements of the classifications in accordance with USCS listed below
 - 1. Acceptable Classifications: GW, GP, GM, GC, SW, SP, (course) SC, and CL.
 - 2. Unacceptable Classification: Pt, OH, SP (fine) OL, CH, ML, SM, and MH.
- C. Cohesionless Materials: Cohesionless materials include poorly and well graded gravels (GP and GW) and poorly and well graded sands (SP and SW). Cohesionless soils are generally regarded as free draining.
- D. Cohesion Materials: Clayey gravels (GC), clayey sands (SC), lean clays (CL), fat clays (CH), silts (ML and MH), and organic materials (OL and OH). Materials such as gravel silt mixtures (GM) and silty sands (SM) will be considered cohesionless only when the fines have a plastic index or O. Otherwise they will be considered cohesive.

PART 3 EXECUTION

- 3-1 CLEARING: All brush, trees, stumps, roots, and deleterious or undesirable material that does not meet specifications for acceptable materials shall be stripped from the source pit area sufficiently in dimension to prevent subsequently mixing of unapproved materials.

- A. PLACING: Comply with the requirements of Section - "Earthwork".

END OF SECTION 312000

SECTION 312100 - EXCAVATION

1.1 - GENERAL

- A. Definitions in this Section include the following:
 - 1. Engineered Compacted Fill: Layered soil material provided as a base for footings and other building structural elements including concrete floor slabs.
- B. Testing and Inspection Service: See Section 014000 - Quality Control. Contractor will employ and pay a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- C. Existing Utilities: Do not interrupt existing utilities except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.

1.2 - PRODUCTS

- A. Fill Materials: Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, or other deleterious matter.
- B. Bedding Material: Sub-base materials with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

1.3 - EXECUTION

- A. Preparation: Protect structures from damage created by earthwork operations.
- B. Excavate for structures, to indicated elevations and dimensions. Widen excavations to permit placing and removing concrete formwork, installing services and other construction, and for inspections. Trim sub-grades to required lines and grades to leave solid base to receive other work.
- C. Place fill materials in layers not more than 8 inches in loose depth for material compacted by hand-operated tampers.
- D. Compact fill to not less than the following percentages of maximum dry density according to ASTM D 1557:
- E. Field Quality Control: Allow testing agency to inspect and test each sub-grade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
 - 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), ASTM D 2922 (nuclear method) or ASTM D 2937 (drive cylinder method), as applicable.
 - 2. Footing Sub-grades: Test each soil stratum to verify design bearing capacities. Multi-layered fill testing requirements are the same for each required lift.
 - a. Continuous Footings: 1 - test per lift per each 15 lineal feet minimum.
 - b. Floor slab: 2- tests.
 - c. Side Walks: 4 tests.
 - d. Pavement: 2 tests.
 - e. Utility line compaction: 1 test per 50 lineal feet.

END OF SECTION 312100

SECTION 312221 - BUILDING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of buildings and site improvements.
 - 2. Removing below-grade construction.
 - 3. Disconnecting, capping or sealing, and removing site utilities.

1.2 DEFINITIONS

- A. Demolish: Completely remove and legally dispose of off-site.
- B. Recycle: Recovery of demolition waste for subsequent processing in preparation for reuse.
- C. Salvage: Carefully detach from existing construction, in a manner to prevent damage, for re-use where and as directed.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 SUBMITTALS

- A. Proposed Protection Measures: Submit informational report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services.
 - 3. Shutoff and capping or re-routing of utility services.
- C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.6 PROJECT CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Structures immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for buildings and structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. On-site storage or sale of removed items or materials is not permitted.

1.7 COORDINATION

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Division 2 Section "Earthwork."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

- A. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.
 - 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 - 2. Arrange to shut off indicated utilities with utility companies.
 - 3. Cut off pipe or conduit a minimum of **24 inches (610 mm)** below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
- C. Salvaged Items: Comply with the following:
 - 1. Clean salvaged items of dirt and demolition debris.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction, and as indicated. Comply with requirements in Division 1 Section "Temporary Facilities and Controls."
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

- A. General: Demolish indicated existing buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 - 2. Maintain fire watch during and for at least 2 hours after flame cutting operations.
 - 3. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- C. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
 - 1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- D. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.
- E. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within **5 feet (1.5 m)** outside footprint indicated for new construction. Abandon utilities outside this area.
 - 1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Division 2 Section "Earthwork."

3.6 SITE RESTORATION

- A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Division 2 Section "Earthwork."
- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.7 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Do not burn demolished materials.

3.9 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by building demolition operations. Return adjacent areas to condition existing before building demolition operations began.

END OF SECTION 312221

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hot-mix asphalt patching.
2. Hot-mix asphalt paving.
3. Pavement-marking paint.

B. Related Sections:

1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Material Certificates: For each paving material, from manufacturer.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Utah Department of Transportation (UDOT).
- B. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of UDOT for asphalt paving work.
- C. Preinstallation Conference: Conduct conference at Project site.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
1. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
 2. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F (4.4 deg C) for oil-based materials, and not exceeding 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.
- B. Fine Aggregate: ASTM D 1073, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.
- C. Mineral Filler: ASTM D 242, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

- A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22.
- B. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

2.3 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.
- B. Pavement-Marking Paint: MPI #32 Alkyd Traffic Marking Paint.
 - 1. Color: Yellow.

2.4 MIXES

- A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
 - 1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
 - 2. Base Course: 8" graded granular road base.
 - 3. Surface Course: 2 ½" asphalt pavement.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

- A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.

Remove excavated material. Recompect existing unbound-aggregate base course to form new subgrade.

- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.3 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
- C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).
 - 1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
 - 1. Spread mix at minimum temperature of 250 deg F (121 deg C).
 - 2. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.5 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat to joints.

3.6 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 - 1. Average Density: 92 percent of reference maximum theoretical density according to ASTM D 2041, but not less than 90 percent nor greater than 96 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.7 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch (13 mm).
 - 2. Surface Course: Plus 1/4 inch (6 mm), no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:
 - 1. Base Course: 1/4 inch (6 mm).
 - 2. Surface Course: 1/8 inch (3 mm).

3.8 PAVEMENT MARKING

- A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.
- B. Allow paving to age for 30 days before starting pavement marking.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Replace and compact hot-mix asphalt where core tests were taken.
- C. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.10 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216

SECTION 328400 – PLANTING IRRIGATION

1.1 GENERAL

- A. The scope of work is to repair and extend the existing irrigation system.
- B. The irrigation contractor shall prepare an irrigation plan, for areas surrounding the new building where system is required to be expanded, to be reviewed and approved by the Architect prior to construction.
- C. Operation shall be controlled by a new automatic timer system.
- D. Piping: Match the existing system.
- E. Minimum Water Coverage: 100 percent of turf and planting areas.
- F. Minimum Working Pressures: Verify pressure availability with water service provider.
- G. Comply with ASTM F 645, "Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems."
- H. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated devices.

1.2 PRODUCTS

- A. All materials shall match the existing system.
- B. PVC Pipe: ASTM D 1785, PVC 1120 compound, Schedules 40 and 80.
- C. PVC Socket Fittings, Schedule 80: ASTM D 2467.
- D. PVC Threaded Fittings: ASTM D 2464.
- E. Valves: Match existing system.
- F. Automatic Drain Valves: Spring-loaded, ball valve of corrosion-resistant construction and designed to open for drainage if line pressure drops below 2-1/2 to 3 psig (17 to 20 kPa).
- G. Control-Valve Boxes: PE, ABS, fiberglass, polymer concrete, or precast concrete box and cover, with open bottom, openings for piping, and designed for installing flush with grade. Include size as required for valves and service.
 - 1. Drainage Backfill: Cleaned gravel or crushed stone, graded from 3 inches (75 mm) maximum to 3/4 inch (19 mm) minimum.
- H. Sprinklers: Manufacturer's standard sprinklers designed for uniform coverage over entire spray area indicated, at available water pressure. Match existing system.
- I. Wiring: UL 493, Type UF, solid-copper-conductor, insulated cable, suitable for direct burial.

1.3 EXECUTION

- A. Install piping and wiring in sleeves under sidewalks, roadways, and parking lots.
- B. Drain Pockets: Excavate to sizes indicated. Backfill with cleaned gravel or crushed stone, graded

from 3 to 3/4 inch (75 to 19 mm) minimum, to 12 inches (300 mm) below grade. Cover gravel or crushed stone with sheet of asphalt-saturated felt and backfill remainder with excavated material.

- C. Provide minimum cover over top of underground piping according to the following:
 - 1. Pressure Piping: Greater depth of minimum of 36 inches (914 mm) below finished grade, or not less than 18 inches (500 mm) below average local frost depth.
 - 2. Circuit Piping: 12 inches (300 mm).
 - 3. Drain Piping: 12 inches (300 mm).
 - 4. Sleeves: 24 inches (600 mm).
- D. Piping Applications: According to the following:
 - 1. Underground Branches and Offsets at Sprinklers and Devices: Schedule 80 PVC pipe, PVC threaded fittings, and threaded joints.
 - 2. Risers to Aboveground Sprinklers and Specialties: Schedule 80 PVC pipe, Schedule 80 PVC socket fittings, and solvent-cemented joints.
 - 3. Drain Piping: Schedule 40 PVC pipe, Schedule 40 PVC socket fittings, and solvent-cemented joints.
 - 4. Sleeves: Schedule 80 PVC pipe, Schedule 80 PVC socket fittings, and solvent-cemented joints.
- E. Pipe joint construction requirements.
 - 1. PVC Piping Gasketed Joints: Construct underground joints between cast-iron valves and PVC pipe with elastomeric seals that fit pipe and valve ends. Use lubricant according to ASTM D 3139.
- F. Install piping at uniform slope of 0.5 percent minimum, down toward drain valves.
- G. Install fittings for changes in direction and branch connections.
- H. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.
- I. Lay piping on solid subbase, uniformly sloped without humps or depressions.
- J. Install PVC piping in dry weather when temperature is above 40 deg F (4.4 deg C). Allow joints to cure at least 24 hours at temperature above 40 deg F (4.4 deg C) before testing, unless otherwise recommended by manufacturer.
- K. Control Valves: Install in control-valve service box.
- L. Drain Valves: Install in control-valve box.
- M. Install lawn sprinklers at manufacturer's recommended heights.
- N. Install controllers according to manufacturer's written instructions and as indicated.
- O. Install control wiring in same trench with piping. Install wiring with loops at control valves and controllers, at intervals not greater than 100 feet (30 m), and changes in direction to allow for expansion. Bundle wiring in same trench at 10-foot (3-m) intervals.
- P. Connect piping to valves, sprinklers, and specialties.
- Q. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- R. Ground electric-powered controllers, valves, and devices.

- S. Testing: Hydrostatically test piping and valves before backfilling trenches. Piping may be tested in sections.
1. Cap and test piping with static water pressure of 50 psig (345 kPa) above system operating pressure and without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours.
 2. Repair leaks and defects with new materials and retest system or portion thereof until satisfactory results are obtained.
- T. Flush dirt and debris from piping before installing sprinklers and other devices.
- U. Adjust automatic control valves to provide flow rate of rated operating pressure required for each sprinkler circuit.
- V. Carefully adjust lawn sprinklers so they will be flush with, or not more than 2 inch (13 mm) above, finish grade.
- W. Adjust settings of controllers and automatic control valves.
- X. Starting Procedures: Follow manufacturer's written procedures. If no procedures are prescribed by manufacturers, proceed as follows:
1. Verify that specialty valves and their accessories are installed and operate correctly.
 2. Verify that specified tests of piping are complete.
 3. Verify that sprinklers and devices are correct type.
 4. Verify that damaged sprinklers and devices are replaced with new materials.
 5. Verify that potable-water supply connections have backflow preventers.
 6. Energize circuits to electrical equipment and devices.
 7. Adjust operating controls.
- Y. Operational Tests: Measure and record water flow rate and area coverage at each sprinkler. Adjust to achieve indicated values.

END OF SECTION 328400

SECTION 329200 - GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Seeding.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Certification of grass seed.

1. Certification of each seed mixture for turfgrass sod.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species: State-certified seed of grass species as follows:

1. Full Sun: Crested Wheat Grass – Range Mix.

2.2 FERTILIZERS

- A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

PART 3 - EXECUTION

3.1 SEEDED AREA PREPARATION

- A. Newly Graded Subgrades: Loosen subgrade to a minimum depth of **4 inches (100 mm)**.

1. Apply fertilizer directly to subgrade before loosening.

- B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus **1/2 inch (13 mm)** of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.2 SEEDING

- A. Do not broadcast or drop seed when wind velocity exceeds **5 mph (8 km/h)**. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of **3 to 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m)**.
- C. Rake seed lightly into top **1/8 inch (3 mm)** of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of **2 tons/acre (42 kg/92.9 sq. m)** to form a continuous blanket **1-1/2 inches (38 mm)** in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

END OF SECTION 329200

SECTION 330500 - UTILITY INSTALLATIONS AND IMPROVEMENTS

PART 1 GENERAL

All Utility construction except electrical service shall be according to this section and shall comply with all local utility company requirements.

Soil Report for the project site is available upon request.

- 1-1 DESCRIPTION: The work of this section includes the provision of all items, articles, materials, operations, or methods listed, mentioned or scheduled on the drawings and/or herein specified, including labor, finished surface repair, materials, equipment, trenching, bedding and incidentals necessary and required for their completion.
- A. The work includes all utility piping installations within the project construction areas as shown the drawings. All connections to existing utility service mains shall be completed and made operational. Storm sewer piping including all appurtenances shall be constructed as shown on the drawings. The systems, in general, shall include trenching, bedding, backfill, compaction, piping, fittings, manholes, concrete boxes, castings and covers, clean-outs, catch basins, valves and valve boxes, thrust blocks and all other incidental items required for a complete and operational utility system. All work shall be done in accordance with current State Plumbing Code, State Safe Drinking Water Act, Fire Marshal approved standards and N.F.P.A. and all local and city codes where applicable.
 - B. The work includes removing and replacing ground surface features required to complete all utility installations. This work shall include but not be limited to concrete curbs, asphalt surfaces with gravel base course, fences and grassed areas. Contractor shall treat and repair all construction damaged or disturbed areas unless specifically noted otherwise on drawings.
 - C. Repair of existing finished surfaces disturbed by the construction shall be to original standard prior to the new construction. All repaired surfaces shall match existing surfaces in material and alignment. Asphalt surfaces to be repaired shall be cut to neat lines and full depth gravel and asphalt placed in the repaired areas. Concrete work and curbs removed shall be cast-in-place to match existing grades.
 - D. Contractor shall coordinate all connections and disruption of water service. Contractor shall provide new connections to 8-inch existing water mains and coordinate all connections with City Department Public Works Officials. Contractor shall notify the Owner in writing ten (10) days prior to connecting to any service.
- 1-2 SAFETY: Contractor shall be responsible for safety in the project area and shall take all necessary precautions to insure a safe work environment.
- 1-3 GENERAL REQUIREMENTS:
- All primary electrical service, transformers, transformer pads, communication service lines and posts and gas service lines to be constructed by each utility company.
- All utility services shall be installed within limits of public utility designated easements.
- 1-4 WORK INCLUDED ELSEWHERE:
- A. Concrete: See Division 3.

PART 2 MATERIALS

2-1 WATER SYSTEM: Connect to existing water service system.

- A. Water Piping Less Than Four-Inch Diameter: All piping shall be suitable for domestic water service use. Piping shall be copper or galvanized steel as shown on drawings.
- B. Copper Water Piping and Fittings: Copper pipe shall be Type "K" conforming to the requirements of ASTM specification B-88. Type 'K' shall be used for all exterior and underground installations when indicated on the drawings.
 - 1. All copper piping shall be connected with solder-type fittings, unless otherwise specified. The copper piping 1/2 inch diameter may be annealed or drawn-tempered.
 - 2. Dielectric Fittings: Required at all copper-ferrous metal connections.
- C. Valves (1-1/2 Inch and Smaller): Valves 1-1/2" and smaller used in the buried water line and not shown to be located in concrete boxes shall be "Mark II Oriseal" valves, Minneapolis Top, Solid Tee Head, "Mueller H-10287", as manufactured by Mueller Company, Decatur, Illinois, or approved equal. Valve boxes for "Mark II Oriseal" valves one inch and smaller shall be the extension type curb box with Minneapolis pattern base. The box shall be a Mueller H-10300, as manufactured by the Mueller Company, Decatur, Illinois, or approved equal. Valve boxes for valves 1-1/4 inch through 1-11/2 inches shall be the extension type box with Minneapolis pattern base. For 1-1/4 inch valves the box shall be a Mueller H-10302, and for 1-1/2 inch valves the box shall be a Mueller H-10304 as manufactured by the Mueller Company, Decatur, Illinois or approved equals.

2-2 SEWER SYSTEM:

- A. PVC Pipe: Pipe shall be Bell and Spigot 'PVC' ASTM D-3034 SDR 35 Sewer Pipe With watertight gasketed joint as approved by State Board of Health. Piping shall be "CertainTeed" or "Johns-Manville". PVC piping shall be used unless otherwise shown on the drawings.
- B. Cast Iron Soil Pipe: ASTM A 74, hub and spigot ends, service weight unless otherwise indicated.
 - 1. Fittings: Cast-iron hub and spigot complying with ASTM A 74; lead/oakum caulked joints, or compression joints with rubber gaskets complying with ASTM C 564.

2-3 Sanitary Sewer:

- A. General: Provide precast reinforced concrete sanitary manholes as indicated, and complying with ASTM C 478.
- B. Top: Precast concrete eccentric cone, or flat slab top type, as indicated.
- C. Base: Precast concrete, with base riser section and separate base slab, or base riser section with integral floor as indicated.

2-4 Steps: Ductile iron or aluminum, integrally cast into manhole sidewalls. D & L Supply Co. Lindon, UT; #12653A or approved equal.

2-5 Pipe Connectors: Resilient, complying with ASTM C 923.

2-6 GROUT: Neat Portland Cement and water.

2-7 CONCRETE: According to Division 3.

- 2-8 REINFORCING: According to Division 3.
- 2-9 BOLTS: AISC A 325 unless otherwise noted.
- 2-10 MISCELLANEOUS STEEL: AISC A-36.
- 2-11 BOXES – Septic tank and distribution boxes approved by local governing authority. Shall consist of approved pre-cast concrete or boxes according to details shown on the drawings.
- A. The septic tank drain field construction shall be as shown on the drawings.
- 2-12 BEDDING MATERIAL: All utility pipe buried underground and installed under this section shall be placed in bedding material. Materials shall be predominantly sand and gravel, having a plasticity index less than 6. This material shall be used in utility conduit installation adjacent to utility conduit.
- A. Bedding Material Gradation:
- | <u>Sieve Designation</u>
<u>Square Openings</u> | <u>Percent Passing</u> |
|--|------------------------|
| 1-inch | 100 |
| 3/4-inch | 90-100 |
| 1/2-inch | 20-55 |
| 3/8-inch | 1-15 |
| No. 4 | 0-5 |
- 2-13 Underground-Type Plastic Line Markers: Manufacture's standard, permanent, bright colored, continuous-printed plastic tape, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide green tape with black printing reading "CAUTION: SEWER LINE BURIED BELOW". Tape to be "Allen Systems, Inc.", "EMED Co., Inc.", "Seton Name Plate Corporation", or approved equal.

PART 3 EXECUTION

- 3-1 CLEARING AND GRUBBING AND DISPOSAL OF WASTE MATERIAL: Before starting excavation in any area, all necessary clearing and grubbing in that area shall have been completed. All excess debris, trees, sod and excavated material removed from construction disturbed areas shall be hauled, handled and disposed of off site.
- 3-2 EXCAVATION: Excavation for piping and foundation pits for minor structures or manholes shall be excavated to the lines and grades or elevations shown on the drawings or as designated on the ground. Excavations shall be of sufficient size to permit the placing and backfilling of piping, minor structures, or minor structure footings. Boulders, logs and any other unsuitable materials encountered shall be removed and disposed of off of the site. All excavation shall be considered unclassified.
- A. Structures: All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface that is level, stepped, or serrated. All loose and disintegrated rock and thin strata shall be removed. When the footing is to rest on material other than rock, excavation to final grade shall not be completed until just before the footing is to be placed. When the foundation material is soft or otherwise unsuitable, it shall be removed and replaced with approved granular material. The Contractor shall notify the Owner's Representative when each excavation is completed and receive written approval of the excavation and the foundation material prior to placing footings.
- B. Piping: The width of trenches shall permit satisfactory jointing and accepted tamping of the

bedding material under and around the pipe. Unsuitable foundation material shall be excavated below the invert of the pipe to an approximate depth of 2 feet and a width of at least the pipe diameter plus 4 feet. Unsuitable material shall be replaced with bedding material and compacted. Excavation of unsuitable foundation material shall be included in pipe excavation.

1. Where rock, hardpan or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 1 foot. The width of the excavation shall be at least 2 feet greater than the outside width of the pipe. This excavated material shall be replaced with bedding material and compacted. Excavation of this material shall be included in pipe excavation.
2. Contractor shall provide all materials and labor required for trench shoring or deep trench steel box used for pipe laying in deep trenches. Contractor shall provide all required equipment and supervision to insure safety according to "OSHA" standards for trench construction and excavation.
3. Bedding material and placement shall be included in pipe excavation or manhole and minor structure excavation.
4. Contractor shall provide equipment, labor and all incidental items required to pump, drain or other means to de-water and maintain dry trench bottom conditions for all pipe laying operations.
5. Contractor shall take all necessary precautions to insure structural stability of adjacent utility trenches and foundations during his utility trench excavation and utility construction. Contractor shall minimize impact of disturbed construction areas at all times.

3-3 UTILIZATION OF EXCAVATED MATERIALS: All suitable excavated material shall be utilized as backfill or embankment. No excavated material shall be placed in stock piles and left on the site unless approved by the architect. All surplus material shall be disposed of off the project site. No excavated material shall be deposited in a manner that will endanger the finished structures.

3-4 BACKFILL FOR STRUCTURES OTHER THAN PIPE: Excavated areas around minor structures shall be backfilled with approved free-draining granular material placed in horizontal layers, not over 6-inches in depth, to the level of the original ground surface or finished surface. Each layer shall be compacted.

3-5 COMPACTION: All foundations for minor structures and manholes shall be on undisturbed earth where possible. Disturbed earth foundation shall be mechanically tamped at optimum moisture conditions to provide 95 percent of the maximum dry density as determined by AASHTO T-180 Method C or D. All backfill for **structures** and **piping** shall be layer placed and compacted. All backfill for vehicular traffic areas shall be compacted to 95 percent of maximum dry density as determined by AASHTO T-180, Method C or D. All non-vehicular areas or turfed areas shall be 90 percent of maximum dry density as determined by AASHTO T-180 Method C or D.

A. Compaction shall be obtained by mechanical tamping equipment and methods. Jetting with water, puddling, etc., methods of consolidation is not acceptable.

3-6 BEDDING: Bedding material shall be placed in maximum 8-inch layers to the lines and grades shown on the drawings. Each layer shall be mechanically tamped and compacted.

3-7 BACKFILL FOR PIPE: All native or approved material for all pipe backfill shall be placed in maximum 12-inch layers excluding all rock in excess of 8-inches in any dimension. Material shall be placed to the lines and grades shown on the drawing. Each layer shall be mechanically

tamped and compacted.

- 3-8 PIPE INSTALLATION-SANITARY SEWER : A minimum lift of bedding material shall be placed and compacted in the entire trench bottom prior to pipe section installations. See drawings for minimum lift of bedding below pipe. Contractor shall hand excavate all bell locations to provide continuous bearing of pipe section along its entire length.
- A. Piped installation shall be such that bell end is up grade. Pipe shall be placed according to detail shown on the drawings. Gradient and alignment shall be with laser equipment installation.
 - B. No pipe shall be placed in service until a suitable outlet is provided. Installation shall include backfill bedding and compaction. Bedding shall be layer placed to point 12-inches above top of pipe unless noted otherwise on drawing.
 - C. Plastic Pipe: Install in accordance with manufacturer's installation recommendations, and in accordance with ASTM D 2321.
- 3.9 Cleaning Pipe: Clear interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.
- A. In large, accessible piping, brushes and brooms may be used for cleaning.
 - B. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
 - C. Flush lines between manholes if required to remove collected debris.
- 3.10 Joint Adapters: Make joints between different types of pipe with standard manufactured adapters and fittings intended for that purpose.
- 3.11 Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydro-static of earth pressure which may result after ends of abandoned utilities have been closed.
- A. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods for size and type material being closed. Wood plugs are not acceptable.
- 3-12 PIPE INSTALLATION - OTHER: A minimum of 2-inch thick lift of bedding material shall be placed and compacted in trench bottom prior to pipe section installation. Bedding material shall be layer placed to point 8-inches above top of pipe unless otherwise noted on drawings.
- 3-13 TESTS: All testing of utility piping shall be as follows and shall comply with local utility company requirements.
- A. Water Lines: All water lines shall be tested hydrostatically at 175 psi and shall show a pressure drop not more than 5 psi in a 24-hour period.
 - B. Sanitary System: The sanitary sewer piping shall be tested by plugging all outlets and filling the lines with water to point 15 feet above highest elevation of pipe invert being included in test. The water level shall not drop more than 3-inches in 1 hour. All joints within the project shall be inspected for visible leaks.
 - 1. Approved air test may be used in lieu of water test specified.
 - C. Defective Work: If inspection or tests show defects, such defective work or material shall be replaced or corrected and inspection and tests shall be repeated. All repairs to piping shall be made with new materials. No caulking or screwed joints or holes will be acceptable.

1. All defects in materials and workmanship which appear during the test shall be promptly remedied and the test shall be reapplied.
 - D. Required Adjustments: Prior to final acceptance, each piping system shall be demonstrated to be operational in the presence of the architect or his engineer. The contractor shall remedy all deficiencies. On the day of acceptance, the installed storm drain and sanitary sewer system shall be free of debris and any obstructions to flow.
 1. The entire project site shall be cleaned up, finished surfaces repaired and all disturbed surface features repaired at the time of final acceptance. Final cleanup shall be as approved by architect.
- 3-14 STRUCTURES: Furnish and install structure of size shown and at all locations shown on the drawings or as required by city, utility company or irrigation company. The concrete structures shall be built with steel reinforcing according to details on drawings.
- A. Precast concrete septic tank and distribution boxes approved by local governing agency.
 - B. Reinforcing steel shall be placed with 2-inch minimum clearance to any form and shall be rigidly secured.
 - C. Finish top of all exposed concrete shall be flush with finished grade of adjacent surface unless otherwise shown on the drawings.
- 3-15 EXPOSED CONCRETE SURFACES: All final finished grade exposed concrete surfaces shall have a broomed finish.
- 3-16 BOX INSTALLATION : Boxes shall consist of cast-in-place reinforced concrete boxes. Bases shall be formed with blockouts to receive precast members. Contractor shall form corners and grout the entire joints of precast or cast-in-place boxes. All grouted surfaces shall be finished smooth and be accepted prior to backfill.
- A. Exterior surface of boxes shall receive coat of asphalt from top to bottom prior to any backfill operation. Backfill shall be layer placed and compacted.
- 3-17 CLEANOUTS: Cleanouts as shown on drawing shall be furnished and installed.
- 3-18 SLOPE OF PIPE: Sanitary sewer piping shall be run with slopes 0.0050 feet per foot or greater. Storm drain piping minimum slope shall be 0.0040 feet per foot. Roof drain piping minimum slope shall be 0.0100 feet per foot. Water piping shall be graded to eliminate air pockets. Contractor shall provide approved air/vacuum valves and boxes at all points of excessive air accumulation or at points indicated on the drawings.
- 3-19 MINIMUM BURY OF PIPE: All piping shall be protected against freezing. Water piping shall have 5 feet cover over pipe. Sanitary sewer piping shall have 4'-6" cover over piping. Storm drain and roof drain piping shall be 2'-6" minimum cover piping. All minimum cover requirements shall be as specified unless specifically noted otherwise on drawings.
- 3-20 WATER LINE/SEWER LINE: All construction shall be according to State Plumbing Code. Sewer piping shall pass below water piping to maintain 18-inches vertical separation from bottom of water pipe to top of sewer pipe. Sewer pipe shall be continuous single section of ductile iron pipe 10 feet either side of crossing point.
- A. Sewer piping and potable water piping shall not be run in common trench. Ten foot Horizontal separation between water piping and sewer piping shall be maintained.

- B. Disinfection and Cleaning of Potable Water Lines: All works shall be according to State Board of Health Standards.
- C. All new, cleaned or repaired existing water mains or appurtenances shall be disinfected in accordance with AWWA Standard C601.
- D. On all new and extensive distribution system construction, evidence of satisfactory disinfection must be provided to the State Board of Health Standards.
- E. All new, cleaned or repaired existing water mains or appurtenances shall be disinfected in accordance with AWWA Standard C601.
- F. On all new and extensive distribution system construction, evidence of satisfactory disinfection must be provided to the State Board of Health. Samples for bacteriologic analysis must be collected after disinfection is complete and the system is refilled with potable water. The use of water for culinary purposes must not commence until the bacteriologic tests indicate the water to be free from contamination.
- G. As a minimum, the following procedure shall be followed:
 - 1. The main shall be flushed prior to chlorination as thoroughly as possible with the water pressure and outlets available unless chlorine tablets were placed in each length of pipe as the main was laid. Flushing shall be done after the pressure test has been made. If no hydrant is installed at the end of the main, a tap should be provided large enough to develop a velocity in the main of at least 2.5 fps. Before being placed in service, all new mains shall be chlorinated so that a chlorine residual of not less than 50 p.p.m. remains in the water after 24 hours standing in the pipe. Chlorination of the line shall be performed in accordance with AWWA C601. In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent. Tests for chlorine residual shall be made by the appropriate health agency. Following chlorination, all treated water shall be thoroughly flushed from the pipe line at its extremities until the replacement water throughout its length shall, upon test, be provided comparable in quality to the water serving the public from the existing water supply system and approved.

3-21 GUARANTEE: By the acceptance of any contract award for the work herein described or shown on the drawing, the Contractor assumes the full responsibility imposed by the guarantee as set forth herein and in the General Conditions and should protect himself through proper guarantees from equipment and special equipment contractors and from subcontractors as their interests may appear.

- A. The guarantee so assumed by the Contractor and as work of this Section is as follows:
- B. Materials used in sanitary sewer and water systems complete shall be free of defects and shall remain operational. Valves shall be operational.
- C. The Contractor shall make prompt and free of charge, upon notice from the Owner, any necessary repairs due to defective workmanship or materials that may occur during a period of one year from date of Substantial Completion.

END OF SECTION 330500